amateur radio

FEBRUARY, 1974

- FT 101B REVIEW
- GOOD QUALITY CW FROM THE 122
- DIRECT CONVERSION RECEIVERS
- OSCAR 7 AND ITS CAPABILITIES
- SERIES MODE CRYSTAL OSCILLATOR
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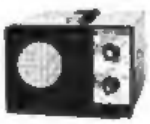

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amateur radio

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CONTENTS

FRONT COVER

Who will be the first to qualify for this magnificent A.C.E. 125 award? ZL2AH was the first to qualify for the A.C.E. award. Alex Slight VK2ZA put a tremendous amount of work into the design of the two certificates and a supply has now been printed on embossed Italian paper. See AR, August 1973, for details of the award.

QSP

AMATEUR RADIO — A GOOD THING IN LIFE

Consider for a moment our good fortune to be living in an age when so much is to be had of the good things in life. What could you have been doing a hundred years ago in your leisure time? Try listing the activities you have now which could not have been had then. Even simple things like swimming were virtually unknown. To travel was a perilous adventure.

Technology has brought us so much. Where would we be without the material things we use for enjoyment of the good life. Every preacher warns about the evils of materialism. Every saint stresses the things of the spirit.

Where do you and I stand in all this? Where are we going?

Amateur radio is helping us along the road and we owe it to our hobby to treat it right. The future of our hobby is in our hands but it is the past which has given us this wonderful leisure activity.

It is a finely balanced activity like the receivers and transmitters we operate. These must be designed within certain parameters. Ignore those parameters and you fail. Work within them and you succeed.

So it is with amateur radio. Recognise and observe its parameters. Help others to recognise and observe them, and so help others to enjoy amateur radio the way it should be enjoyed. Whether you like it or not, amateurs must be the goodies in life. This is no pastime for the baddies.

The forces of materialism surround us. These are very powerful forces and their voices are as sweet as honey. Take away our frequencies and amateur radio would cease. There is the key! We must work to prevent this.

The keynote of trade unionism is "united we stand, divided we fall". If amateur radio is to survive we must also adopt this slogan and abide by it. You look to the Institute for support and protection, but you must also give the Institute your support. It is your Society, run for you by other members who devote much of their spare time to it, free of charge.

I have felt it necessary to say these things because over the past few years some amateurs have consciously or unconsciously harmed our image in one way or another.

In order to survive we must create and maintain a good image. Survive we will. Despite the doubters in our ranks who, you will notice, are still enjoying amateur radio.

David Wardlaw VK3ADW,
Federal President.

JOHN MOYLE MEMORIAL NATIONAL FIELD DAY

FEBRUARY 9th & 10th

JOIN IN THE FUN — MAKE THIS THE BEST FIELD DAY YET

THE COST AND WORK OF THE EXECUTIVE OFFICE

The Federal Council during the Easter 1973 Convention in Melbourne directed that out of the subscriptions received from Full and Associate members the sum of $7.20 be allocated from each towards the costs of the Executive office including the cost of AR and the 20 cents annual contribution for IARU.

The Executive is charged with carrying out the policies laid down by the Federal Council and to provide these services within the approved budget —

Centralised subscriptions processing
Centralised membership records
Production of AR
Production of the Call Book
Magpubs
Negotiations and contact with Federal Government Departments and Federal organisations.
Liaison with IARU and overseas sister societies
General supervisory services affecting common objectives including especially —
YRCS
Intruder Watch
Awards
Australian Contests
Band Planning
Key Section
RTTY Section (AARTG)
Project Australis

Maintaining an office for central control and intercommunications, general administration and associated clerical functions.

The Executive's small office is managed by one full-time Secretary, who is also the legal Public Officer of the W.I.A., assisted by one, or occasionally two, part-time clerical assistants. All other Executive work is done by unpaid volunteer members of the Institute usually appointed by the Federal Council. The 'Managing' Editor of AR is not a member of the Executive if he receives a small honorarium for his work on AR.

The address of the Executive office is P.O. Box 150, Toorak, Vic. 3142. No mail should be sent to any other address — unless specially requested — because other post boxes are cleared very infrequently.

Radio Astronomy Explorer-B; Explorer 49.

The last scheduled U.S. space mission to the moon was launched 9th June 1973 with aerials as tall as the Empire State Building when fully extended and in circular orbit 1100 Km above the moon. ITU Telecommunication Journal Oct. '73 goes on to say that Explorer 49 (its orbit name) is conducting the most extensive study ever undertaken of low frequency signals from galactic and extra-galactic radio sources and from the sun, earth and Jupiter. This cosmic radio noise, in the 20 kHz to 13MHz region of the electromagnetic spectrum, is not observable from the ground because of the obscuring effects of the earth's ionosphere. Explorer-49 is isolated from extraneous radio noise from earth by using the moon as a shield as it orbits the far side during its 225 minute orbital period.

Technical articles.

If your article has been accepted for publication don't expect to see it published in the very next issue. The production times for a monthly magazine are probably much longer than you ever imagined. The articles for this issue, for example, were being prepared for publication during the month of June. Editorial in 'Ham Radio' October '73. (AR is thus no exception — Ed.)

Pinhead stereo — what next?

South African scientists have developed and manufactured a miniaturised electronic circuit packing all the components found in a conventional hi-fi system into an area smaller than a pinhead. S.A. Digest 21.12.73.

Israel Symposium.

A note from the Israel Amateur Radio Club advises that their "International Symposium of Radio Amateurs in the Satellite Era" was duly held in Tel-Aviv on June 25th-26th last. Several hundred amateurs participated from 15 countries including Australia in this event which commemorated Israel's 25th Anniversary Contest won by DJ6QT who was present. The Symposium was opened by their Minister of Communications and talks were given by George Jacobs W3ASK, Art and Madeline Greenberg W2LH and W2EEO and others. 'A successful and memorable event' was the description of this symposium and the social parties which developed from it.

Standards Association.

The S A A has published Australian Standard 1053 which prescribes limits for conducted and radiated interference to radio broadcasting services emanating from radio and television receivers. The limits are similar to those recommended by C I S P R. The press release goes on to state,

The prescription of limits stringent enough to give full protection to all broadcast reception, including that in areas of low field strength, is impracticable. These limits are a compromise between higher receiver costs and desirable limits in order to protect broadcasting services in those areas most likely to be affected. It is appreciated that the standard will not provide adequate protection for other services under all circumstances but it is considered to offer the best protection possible at present.

RECIPROCAL LICENCES — U.K.

"Mobile News" October '73 advises that from September 1973 the temporary licences issued by the U.K. Ministry of P. and T. to foreign amateurs under reciprocal licensing agreements will be valid for 6 months instead of 3 months as in the past.

oscar 7 and its capabilities

(what it is, and how to use it)

Joe Kasser G3ZCZ/W3 and
Jan A. King W3GEY

C/O Amsat, P.O. Box 27,
Washington, DC, 20044, U.S.A.

This paper, presented at the American Radio Relay League Technical Symposium, Reston, Virginia on Sept. 14, 1973, briefly describes the OSCAR 7 radio amateur satellite, its modes of operation, its orbit and tracking information, and also specifies the type of ground equipment needed to work through or receive signals from the spacecraft.

The Spacecraft

Oscar 7 is the second in the AMSAT-OSCAR-B series of long-life amateur spacecraft. It is built in an octahedral (8-sided solid) configuration, allowing sufficient surface area for enough solar cells to provide a positive power budget system. This means that unlike OSCAR 6, this spacecraft should not have to be commanded into recharge modes periodically.

Physically, the experiments and individual modules are built in a "plug-in module" construction. This allows the same spacecraft configuration to contain a number of different experiments and modules. The main difference between this spacecraft and OSCAR 6 is that OSCAR 7 contains two repeaters and two auxiliary beacons, and both Morse code and teletype telemetry encoders.

The OSCAR 7 two-to-ten metre repeater has an output power of 2 watts PEP. This will make received signals somewhat stronger at the ground than those coming from OSCAR 6 The second repeater is the AMSAT-Deutschland repeater which relays signals from 432MHz to 145.9MHz with an internal beacon on 145.98MHz. The unit was designed and built by Dr Karl Meinzer, DJ4ZC and Werner Haas, DJ5KQ. The two beacons consist of a Canadian-built 435.1MHz beacon similar to the one flown on OSCAR 6, and a second auxiliary beacon at 2304MHz developed by members of the San Bernardino Microwave Society.

Ground control of the spacecraft is achieved by means of command receivers in each repeater, redundant command decoders and an Experiment Control Logic subsystem.

Downlinked telemetry and stored message data are generated by the Morse code telemetry encoder, or the Codestore unit, these two systems being identical to those flown on OSCAR 6, and a new teletype telemetry encoder designed and built by Dr Peter Hammer, VK3ZPI and Edwin Schoell, VK3BDS.

The Codestore, Morse code telemetry and teletype telemetry signals can be routed to any of the four beacons in the spacecraft.[1] The four beacons include two in the repeaters and two auxiliary transmitters in a similar manner to OSCAR 6. It is thus possible, for example, to receive Morse code telemetry on the 29.45MHz beacon and teletype telemetry on the 435.1MHz beacon at the same time (on two receivers).

The primary power source of the spacecraft consists of eight solar cell arrays supplying 2.2 Amps at 6.4 volts when illuminated by the sun. A Battery Charge Regulator converts the raw solar cell array output to a +14 volt supply bus. This supply line charges the battery and supplies the spacecraft loads if the solar cell current is not sufficient to run the spacecraft (for example when the satellite is on the dark side of the earth). During these periods, the Nicad battery supplies the extra power. Two other redundant switching regulators supply the remaining voltages needed by the spacecraft modules.

Modes of Operation

OSCAR 7 has four automatic modes of operation defined as follows:

Mode A AMSAT two-to-ten meter repeater.

Mode B AMSAT Deutschland 432-to-146MHz repeater in high-power mode.

Mode C AMSAT Deutschland 432-to-146MHz repeater in low-power mode.

Mode D Recharge mode.

Each of these modes of operation may be overridden by ground command. In Mode D either the 435.1MHz or the 2304MHz beacon can be operational upon ground command, while none of the repeaters will be operating. It is also possible to have the 435.1MHz auxiliary beacon operational by ground command while the spacecraft is operating in Mode A. The 2304MHz beacon can be operated in any of the Modes A through D.

The spacecraft will normally alternate between Modes A and B. An internal timer in the spacecraft generates a pulse every 24 hours which causes the satellite to switch between these two modes. The 24-hour timer will be set by ground command so that the mode change can be kept at approximately the same time each day. Thus, each repeater will be operational on alternate days.

The spacecraft contains automatic power supply monitoring circuitry, such that if the battery charge drops 60 per cent below the full-charge value, the spacecraft will automatically switch to Mode C and reset the timer so as to stay in that mode for 24 hours. In Mode C, the AMSAT Deutschland repeater output power is reduced to 2.5 watts PEP, and the battery drain should be reduced sufficiently to permit the battery to be recharged by the solar cell arrays.

The switch to Mode C takes place under low battery charge conditions when the spacecraft is operating in either Mode A or Mode B. If the battery charge recovers, the spacecraft will switch to Mode B at the next 24-hour pulse, and then continue normal operation.

If the battery power does not recover, but deteriorates even further so that the battery charge drops 70 per cent below the full-charge value, the spacecraft will automatically switch to Mode D and reset the 24-hour timer. Both repeaters will then be switched off, but the 435.1 or 2304MHz beacons can be switched on by ground command to allow telemetry to be received.

Modes C and D are actually expected to serve as backup operating modes for use if the spacecraft available power reserves are low. Normally, operation in these modes will not be required.

Each of the modes can be changed by ground command so as to turn any repeater or beacon on or off as required. This is done so that any failure of the automatic control circuits can be overcome by ground command.

Initial Launch Operation

The spacecraft contains an initial condition reset circuit so that the antennas will deploy after separation from the launch vehicle and the spacecraft will power up in Mode D with the 435.1MHz beacon on. No repeaters will be operational for at least the first day, so everyone should forget about working through OSCAR and settle down and copy telemetry. It is expected that the repeaters will not be turned on until the spacecraft has stabilized electrically and thermally, as indicated from telemetry data.

Orbit and Tracking Data

The expected orbit for OSCAR 7 is very similar to OSCAR 6. The orbit is expected to be sun-synchronous with an almost identical period and inclination. Thus, the same tracking procedures used for OSCAR 6 will be suitable for use with OSCAR 7.

OSCAR 7 is expected to be placed into orbit so that it is half an orbit ahead of or behind OSCAR 6. Currently, OSCAR 6 comes over daily at a time about 5 minutes earlier every 48 hours. If all goes well, OSCAR 7 is to be launched so that it will come over about 2½ minutes earlier than OSCAR 6 did the day before, and similarly, OSCAR 6 will come over about 2½ minutes earlier than OSCAR 7 did the day before. It is thus possible to expect that instead of three usable spacecraft passes about two hours apart each evening, there will be five or six passes (assuming OSCAR 6 is in operation) about sixty minutes apart.

The reference orbit data for OSCAR 7 will also be published in the same format as the OSCAR 6 data has been up to now, so as to enable each individual to plot his own orbital information

GROUND EQUIPMENT REQUIREMENTS

In considering the ground equipment needed for OSCAR 7, each repeater or beacon will be discussed separately in terms of the ground equipment needed to operate with it.

AMSAT Two-to-Ten Metre Repeater

The two-to-ten metre repeater operates in a linear mode similar to the unit flown on OSCAR 6. As such, SSB and CW are the

1. There is one exception; the 2304MHz beacon cannot be keyed with Codestore or teletype telemetry.

preferred operating modes. The repeater receives signals between 145.85 and 145.95MHz and re-radiates them between 29.4 and 29.5MHz. There is also a telemetry beacon on 29.50MHz.

Note that these frequencies are different from those employed with OSCAR 6. They reflect comments received on the operational experience obtained with OSCAR 6. The repeater has an output power of 2 watts PEP, so received ground signals should be stronger — but do not throw those pre-amplifiers away yet!

The same equipment used to work through OSCAR 6 will be suitable for working through this repeater, namely a sensitive receiver, and preamplifier if possible, as well as a suitable ten-metre antenna. Since the spacecraft will again be using a linearly polarized 10-metre antenna, the ground station antenna should preferably be circularly polarized. Linearly polarized 10-metre receiving antennas can also be used, but at the sacrifice of some fading.

The transmitting equipment should be capable of putting out no more than 80-100 watts of effective radiated power from the antenna. It is operationally preferable to use a transmitter with an output power of the order of 80-100 watts and a simple ground plane or turnstile antenna than to use a lower powered transmitter and more directional antenna.

Communicating through OSCAR in a low orbit is a challenge for the single operator. Besides tuning the transmitter and receiver, it is necessary to keep both antennas tracking the spacecraft — and then work someone in between. Surely there must be advantages in minimizing the duties to be performed during each pass so as to be able to concentrate on the important business of making contacts through the satellite. This can be partly achieved by using the low-gain antennas and the 80-100 watts indicated.

AMSAT Deutschland 432-to-145.9MHz Repeater

The AMSAT Deutschland repeater is also a linear device. Again, CW and SSB (or controlled-carrier AM) are the preferred operating modes. The repeater has an input frequency passband between 432.125MHz and 432.175MHz, and an output frequency passband between 145.975MHz and 145.925MHz. The output passband is inverted. That is, upper-sideband signals transmitted to the spacecraft would be received on lower sideband.

The relationship between input and output frequencies is such that a received signal on 432.125MHz would be relayed on 145.975MHz, and similarly, a received signal on 432.175MHz would be relayed on 145.925MHz, i.e., tune up the band at 432MHz and down the band at 146MHz. This repeater also has a telemetry beacon on 145.980MHz.

Any receiver with a good 2-metre converter should be able to receive signals from this repeater, even with a simple antenna. Since the spacecraft antennas associated with this repeater are circularly polarized, linearly polarized antennas will be suitable for ground use. If linearly polarized, the receiving antenna for this repeater can be the same one used to work through the 2-to-10 metre repeater.

On the transmitting side, the recommended effective radiated power output is of the order of 300-400 watts. Thus, a 30-watt transmitter will require an antenna with a gain of the order of 10-12dB, but it would be preferable to obtain or even build a 300-watt amplifier and use an omnidirectional antenna to reduce the antenna pointing accuracy requirements.

Though the spacecraft will have circularly polarized antennas for this repeater so that linear antennas at ground stations will work fine, it is important not to forget that circularly polarized ground station antennas can be expected to provide as much as 3dB more signal, and this might be the difference between making or missing a contact. All circularly polarized antennas used with this repeater should be right-hand circularly polarized (RHCP) in the Northern Hemisphere and left-hand circularly polarized (LHCP) in the Southern Hemisphere.

The easiest way of generating RF for the 432MHz uplink is probably to convert a surplus 450MHz FM transmitter strip for CW operation on 432MHz. This should not be too difficult, even for inexperienced VHFers. Other techniques are to triple 144MHz signals to 432MHz or double 220MHz to 440MHz and use a different crystal to transmit on 432MHz. The best method is to build a transverter from say 50MHz to 432MHz. This would allow both SSB and CW operation with full VFO control.

435.1MHz Auxiliary Beacon

The Canadian 435.1MHz beacon will usually be operating when the spacecraft is in Modes A or D. It will not operate while the spacecraft is in Modes B or C because of interference effects with the 432MHz uplink of the AMSAT Deutschland repeater.

Extremely good signal levels were copied from the OSCAR 6 435.1MHz beacon during the early months that it was operating. For receiving the signals, a receiver with any good converter and antenna will be suitable. Again, a circularly polarized antenna would be preferable. The converter should be fitted with a new crystal so as to cover 435.1MHz instead of the more conventional 432MHz.

Doppler shifts of the order of plus or minus 10kHz can be expected on the signals, so be prepared to keep retuning during the pass.

2304MHz S-Band Beacon

The 2304MHz beacon, built by members of the San Bernardino Microwave Society in California, will transmit a "HI" in Morse code followed by thirty seconds of continuous carrier for tracking purposes. The beacon contains an internal thirty-minute timer to ensure positive control which will shut down the beacon 30 minutes after it is commanded on. The 2304MHz beacon can also be keyed with Morse code telemetry on ground command.

Link calculations have been done for the spacecraft-to-ground communications link to determine the sort of equipment needed. Consider a typical ground station using a four-foot dish and a converter with a 6dB noise figure. The link calculations are as follows:

Spacecraft output power (100mW)	+20dBm
Path loss to ground for 2000 miles	-170dB
Thus, signal level at antenna =	-150dBm
Gain of four-foot dish	+ 27dB
Polarization and line losses	- 6dB
Signal power at converter input	-129dBm
Noise power in a 500Hz bandwidth, 6dB noise figure receiver	-141dBm

Thus received signal-to-noise ratio is +12dB

This was calculated for a four-foot dish and a receiver with a bandwidth of 500Hz. The Doppler shift for an overhead pass at this frequency has been calculated to be plus or minus 55kHz. The 3dB beamwidth of the four-foot dish is only 7.5 degrees. Anybody trying to track the S-band beacon is going to have a lot of fun.

COPYING TELEMETRY

OSCAR 7 contains two separate telemetry encoders: a Morse code unit identical to that flown on OSCAR 6 and an 850-Hz shift teletype encoder designed and built in Australia.

Morse Code Telemetry

The Morse code telemetry format is identical to that of OSCAR 6. The format is arranged in six lines of four words. The first digit of each three-figure "word" is the line identifier. Each telemetry frame is separated from the next by the "HI" identifier. The code speed, like OSCAR 6, is commandable between 10 and 20 WPM.

Teletype Telemetry

Sixty channels of data are monitored and encoded by the WIA-Project Australis teletype telemetry encoder. The data is formatted as ten words per line in six lines of data. Each data word contains five digits. The first two digits indicate the channel number and the last three represent the encoded sensor data digits.

Between each data frame are two lines of digital data which provide information on the spacecraft clock and command register status.

The encoder has two operating modes. There is a stepping mode in which each channel is sampled in turn, and a single-channel "dwell" mode in which one channel is sampled continuously. Each line of data is followed by a carriage return, line feed and figures signal, so as to keep the printer in upper case.

The teletype data is transmitted from the spacecraft in Baudot code using 850-Hz shift. Signals will be frequency-shift keyed on 435.1MHz and audio-frequency, shift keyed on 145.98 and 29.500MHz. It may be necessary to be able to reverse the mark and space tones in the ground station terminal unit to receive the AFSK telemetry.

Doppler on the 435.1MHz beacon will be of the order of plus or minus 10kHz for a pass directly overhead. Tests were conducted

2. In this case, LHCP should be used in the Northern Hemisphere and RHCP in the Southern Hemisphere.

from WA3EWJ transmitting FSK RTTY through the 2-to-10 metre repeater in OSCAR 6 during January 1973. It was found that the 5kHz Doppler shift encountered there did not cause any appreciable errors. It was just necessary to keep retuning the receiver every few minutes. Thus, the tuning rate will just have to be increased to cope with the extra Doppler shift.

A better idea is to use a special IF with a 25kHz band-width and a phase-lock loop teletype terminal unit using one of the phase-lock integrated circuits now available at low cost.

SUMMARY

This paper has briefly described OSCAR 7, its projected orbit and the type of equipment needed to operate with it. A summary table of the frequencies of interest is presented below.

Beacons

29.50MHz	Mode A	Associated with the two-to-ten metre repeater.
145.98MHz	Mode B,C	Associated with the 432-to-146MHz repeater
436.10MHz	Mode A,D	Teletype, Morse code or Codestore keying.
2304MHz	Mode A, B, C, D	CW tracking beacon and Morse code telemetry.

Repeaters

Mode A	145.85MHz to 145.95MHz input
Mode A	29.40MHz to 29.50MHz output (non-inverting passband)
Mode B, C	432.125MHz to 432.175MHz input
Mode B, C	145.975MHz to 145.925MHz output (inverted passband)

It is hoped that those reading this article will want to try their hand in participating with OSCAR 7, certainly the most advanced satellite yet developed for the amateur service. ●

REPEATERS.

"Within a fifty mile radius of New York a repeater is active on every 30kHz channel from 146 to 148MHz. But many of the repeaters within this area are either closed to outsiders by PL, Touch Tone, or the like, or else the members of the club operating the repeater make it obvious to a newcomer that his presence just isn't welcome. The most common excuse for this attitude seems to be that the repeater has been built and maintained by club membership dues, and therefore "freeloaders" shouldn't be permitted".

"Ironically, the local clubs warmly welcome transient operators passing through the territory from other call areas, yet these same clubs turn a cold shoulder to members of other local clubs". From WA2LRO article in Aug. 73 CQ.

OCEAN RESEARCH BUOYS.

To reduce costs a study is being made of unmanned ocean-located buoys provided with power supplies and equipment to record and transit observations using low powered transmitters operating through a communications satellite. The use of such systems on HF suffers low speed of data transmission — less than 100 bit-s — and error protection devices. *ITU Telecommunications Journal — Jan. 1973.*

a flashback of almost 50 years

R. G. Stittfold VK6RS,
30 Lynton St., Doubleview, 6018.

In these enlightened days of transistors and IC's, we can count on economy in our equipment in a way that has never been achieved before. But are you correct there? How many even in the OT class know of a successful project of the mid-twenties known as the "Unidyne", interpreted as "single power". It was just that — a valve used for receiving purposes, powered by a single battery, in my own case, a 2v cell.

At this period of time, all valves were battery powered, from 45 to 135 volts on the plate, and were triodes. Most were still bright emitters, such as the 201A filament which drew ¼ amp at 5 volts. Then some Continental genius, maybe at Philips, hit on the plan of putting in a second grid, to which he applied a high tension of 10 volts, and similar power to the plate. This proved very successful. But then the bright boys at *"Popular Wireless"* in London, also thought deeply. What they finally came up with in 1924 or 25, was to use the inner grid of this valve connected to Filament plus (to suck out the space charge from around the hot filament) and also to the plate through the load. The outer grid was now used as the signal grid.

So now we had that "single power" idea in practical form, and it did work well. Regeneration control was particularly smooth, and was by a variable grid leak, or any of the more usual methods. The quietness of operation was uncanny and if no signal was to be heard, the signal grid connection had to be touched with a moist finger tip to check on operation. There was none of the old rushing noise. Sensitivity was good. I still have QSL cards from every State broadcasting station then operating; 2FC in Sydney on 1200 metres could only be copied before 6WF (then the Wally Coxon station) on 1250 metres opened. This was on a single valve receiver, using phones of course, and total power was 0.12 watts. Multi-valve sets were also built, and a friend of mine used to receive 2LO London on the speaker (cone type) with 3 audio stages. But we reckoned he cheated as he used 10 volts or thereabouts

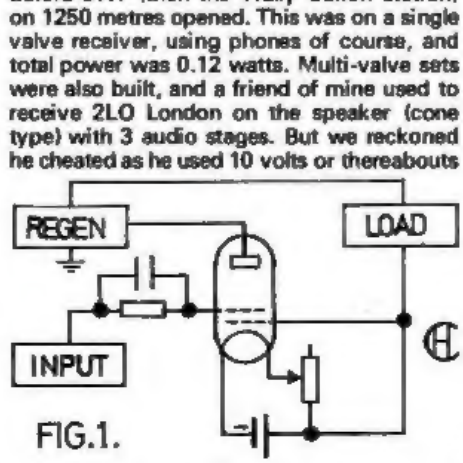

FIG.1.

on the two final stages. Fig 1 is the rough circuit of my single valver, and Fig 2 is an experimental type referred to later in the text.

Shortly afterwards along came the screened grid, and then the screened pentode, both in RF and audio uses. They were followed by the separate cathode and so on to the AC power supply. And so like many another good idea, this one faded.

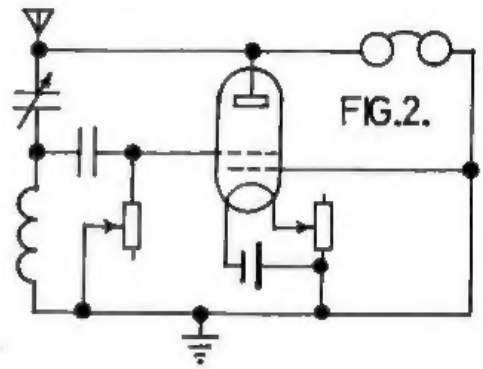
FIG.2.

These were the days when designers by the dozen re-arranged the few components used into various forms and gave them new labels. One, Scott-Taggert, in G-land, published maybe 20 such, under names of S.T.1 (or 19). I modified a number of such to the "Unidyne" principle and found all to work well, even the second circuit shown. Not much imagination is needed to guess results.

However, this 'ere progress keeps on keeping on, so to the "Unidyne" it is curtains. ●

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TH6DXX 10/15/20 M senior 6 el. Yagi, 24' boom not more than **$175**

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Private address where the towers and beams are and the loud signals are produced on the DX Bands: 78 Chapman Parade, Faulconbridge, near Springwood.

direct conversion receivers

K. L. GILLESPIE, VK3GK.
P.O. Box 5, Clayton Vic 3168.

For those people who know nothing of the technique this article provides sufficient information for them to construct a simple and highly successful receiver which can become the basis of a transceiver. In order to maintain simplicity, solid state methods only are discussed, but the idea can be used with thermionic components.

What is Direct Conversion or Synchrodyne reception?

That question may have been asked after reading the review of the Heathkit HW7 in AR for May 1973. Basically direct conversion involves feeding the desired RF signal and a local oscillator signal of the same frequency to a product or linear detector. The output of this 'mixer' is an audio frequency signal. The audio from a product detector has its amplitude proportional to the input signal and this is very nearly so for all signals of small amplitude compared with the VFO or local oscillator. For selectivity the signal is passed through a low pass filter (usually 2 kHz.) and then highly amplified. See Fig 1.

The beauty of the scheme is that there is only a simple pre-selector tuned circuit (all fine tuning being controlled by the local oscillator), no IF alignment, no ganged circuits and if you like, no volume control. Spurious birdies are nil. All this and a receiver of small physical size and low current drain having 2 kHz selectivity and sensitivity on CW down to less than 1 uV. What more could anyone want? SSB reception is excellent but AM leaves much to be desired as the carrier must remain in zero beat with the local oscillator. Any drift or FMing and the resultant sound is horrible.

There are techniques for those who want to use this method for AM but the circuit is no longer quite as simple. Using linear detection with no sideband cutting and, say, a 10 kHz low pass filter, it has excellent possibilities for broadcast reception for the Hi-Fi addict [1,2] Ref. 3 introduces the outline of a complete direct conversion receiver using SL600 IC's.

There is one drawback to direct conversion and that is audio images. A method to overcome these is two phase direct conversion. Here the incoming signal is applied in phase to two product detectors while the oscillator components are applied 90 deg out of phase. The two signals are then combined before reaching the filter and amplifier. [4] Such a receiver would seem to be better than many conventional superhets.

From Fig 1 it can be seen that a receiver may be formed by module sections and constructors can assemble a receiver using their favourite circuit for each module.

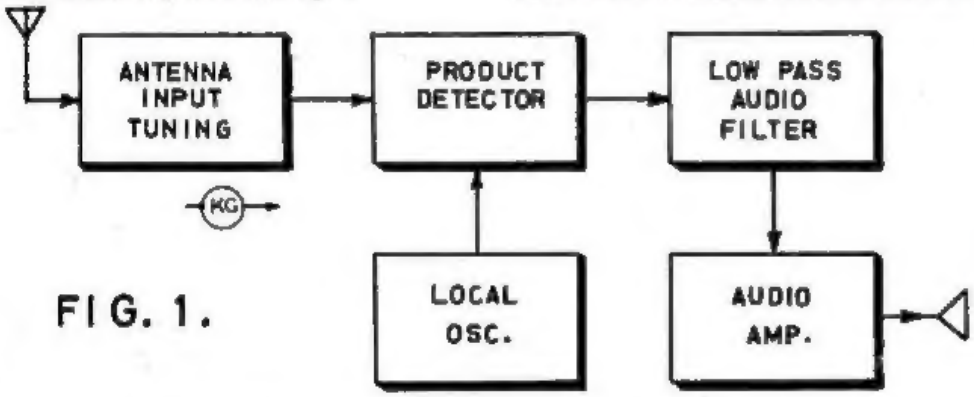
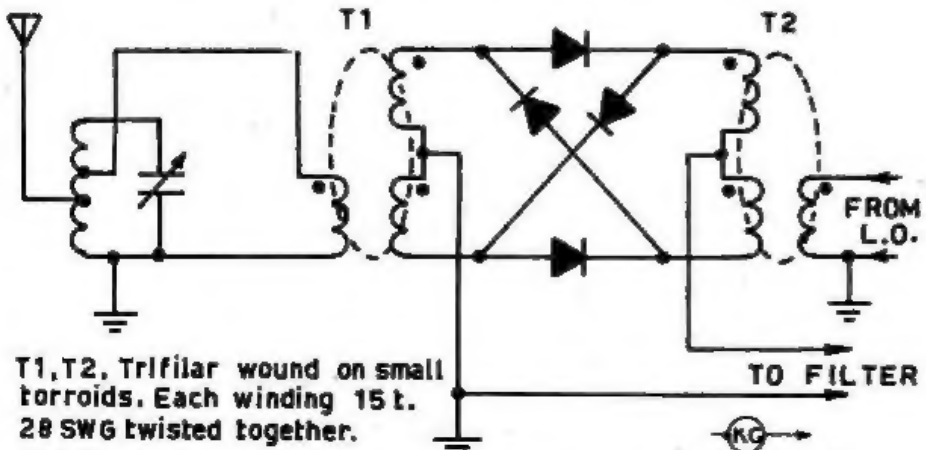


FIG. 1.

BLOCK DIAGRAM OF A D.C. RECEIVER



T1, T2. Trifilar wound on small torroids. Each winding 15 t. 28 SWG twisted together.

FIG. 2. DIODE RING MIXER

Mixers.

As a start, one of the best product detectors is the balanced diode ring mixer using hot carrier diodes. Any fast switching diode from computer boards would perform very nearly as well. Fig 2 shows such a balanced mixer. The nice thing about this is that the local oscillator signal is balanced out and does not appear in the output. Cross modulation is virtually nil and extremely strong signals do not overload the mixer but would tend to saturate the following audio amplifier giving some form of AVC action. There is no conversion gain, but the linearity and absence of noise make up for this lack. The high gain audio amplifier must be a low noise type.

Dual gate MOSFETS, Fig 3, have been used in several designs including the Heathkit HW7 and Ten-Tec PM2 [5] An 0.5 uV signal will produce an audible CW note at the end of the audio chain. Noise figure is low and conversion gain good. There is some susceptibility to cross modulation with strong adjacent signals, but a very nice receiver can be built with this type of mixer.

Integrated circuit Fig 4 a and b differential amplifiers may be used and it is claimed that a 0.1 uV signal can be detected with Fig 4a. A circuit of a direct conversion receiver using the 4b design as the product detector claims that a 0.3 uV signal provides audible CW [6] Conversion gain is greater than MOSFET mixers. The design has cross modulation and overload characteristics similar to many medium and low priced communication receivers.

LOCAL OSCILLATORS

The next block in the system is the local oscillator. Any good VFO will do the job. The main criteria are that it should be **stable** with reasonable output and be free from harmonics. For best results it should be completely shielded from the rest of the receiver and have its power lead adequately bypassed. One thought is W3JHR's "Synthetic Rock" [7]. Another is from VFO Designs and Building a Simple VFO. [8,9]. This reference is particularly good in showing how to eliminate bugs from transistorised VFO's. The above units use bi-polar transistors. I have used with success on 80 metres the FET oscillator shown in Fig 5 which was abstracted from a direct conversion receiver described by W7ZOL and W7WKR [10].

FILTERS

Following the mixer is the low pass filter. Upon this rests the entire selectivity of the

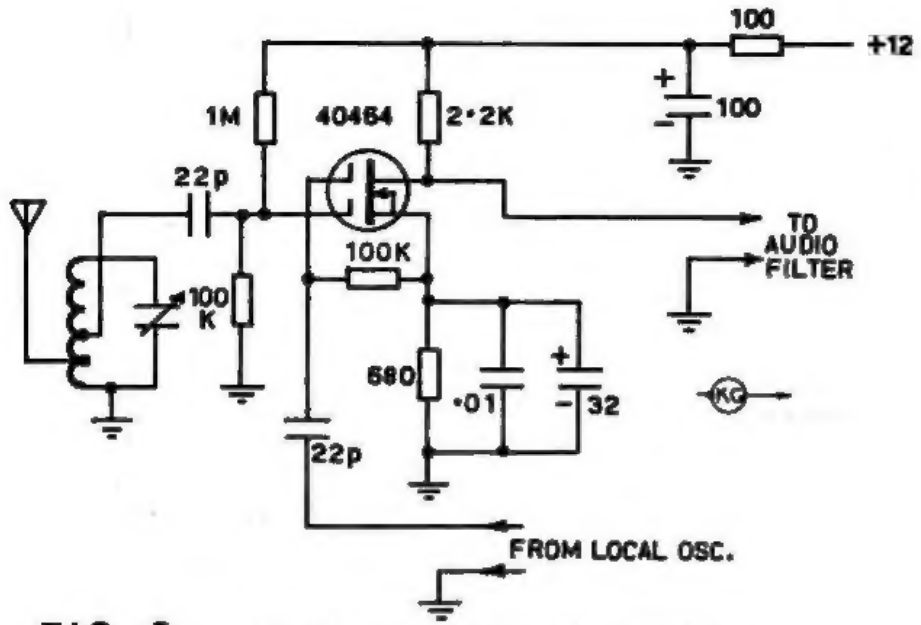


FIG. 3. DUAL GATE MOSFET MIXER

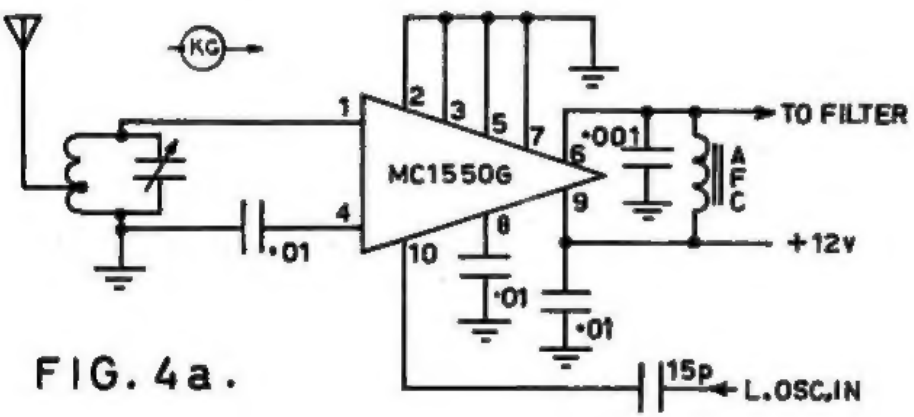


FIG. 4a.

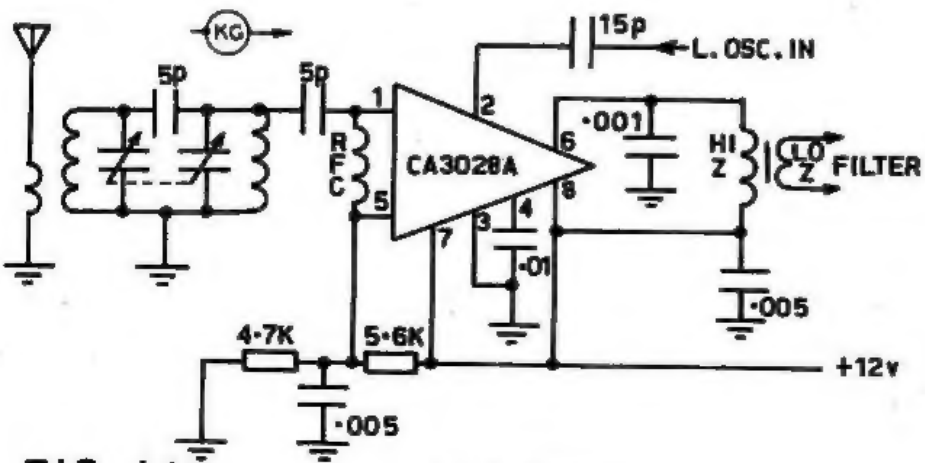


FIG. 4b. I.C. MIXERS

receiver. I should perhaps modify this in saying that further narrow band selectivity may be added for CW reception, but more of this later.

Possibly the best type is the eliptical filter because of its sharp cut-off. Design information for these can be found in previous issues of AR 11 12. See also 13. For those people who want an established design, mine is shown in Fig 6. Further filters can be those used in the receivers of ref. 6, 10.

AUDIO END.

The audio amplifier will get the least mention here. It is definitely up to the builder to choose what he likes, or what he has on hand. Preference is for low noise, high gain. These days there is a variety of ICs which simplify this end of the chain. Some of the lower gain ICs will need a low noise pre-amp between them and the filter. I am using a Fairchild amplifier which uses complementary symmetry with discrete components which give adequate performance.

THE FRONT END

Nothing more than a coil and capacitor tuning over the required band is required here. I would recommend torroidal cores because of their high Q and self shielding from strong RF fields 14. Some slow motion drive on the capacitor helps to accurately peak up the RF. Also I am against any form of RF amplification because it is a potential cause of noise, non-linearity, and susceptibility to cross-modulation. There will be people who debate this but the top class commercial (as distinct from amateur) receivers are leaving them out and a surprising number are using diode ring mixers in the front end for the same reason. If a builder must use amplification then see ref 15 in which a cascode configuration of bi-polar transistors produces better linearity than cascoded FET's. Some sharpening of front end selectivity over the band can be obtained with two tuned circuits lightly coupled if it is felt desired. See Fig 4b. This is an experiment easily carried out in a module design.

MULTIBAND OPERATION

If an all-band VFO is used as a local oscillator then all that is needed is a switchable input tuned circuit. This, by using a 2 to 1 tuning ratio, could cover two bands at a time, thus halving the number of coils. However, a separate coil per band is recommended. Should a single band stable local oscillator have been made, it may be followed by a suitable multiplier chain to provide the correct frequency to the mixer as per Fig 7a.

An idea I would like to try is to use the local oscillator and switchable crystal oscillators to another diode ring mixer, the output of which is the same as the desired signal frequency see Fig 7b. This leads to the superhet arrangement by simply using one or more crystal locked converters ahead of the receiver making it a tunable IF. It is an easy approach because many shacks already have a converter sitting on a shelf just waiting for a receiver.

There should be enough information now for anyone to build a small portable outfit. This can become the basis of a QRP CW

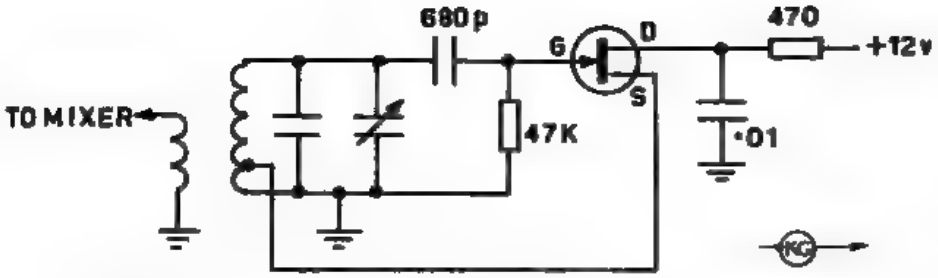


FIG. 5. F.E.T. OSCILLATOR

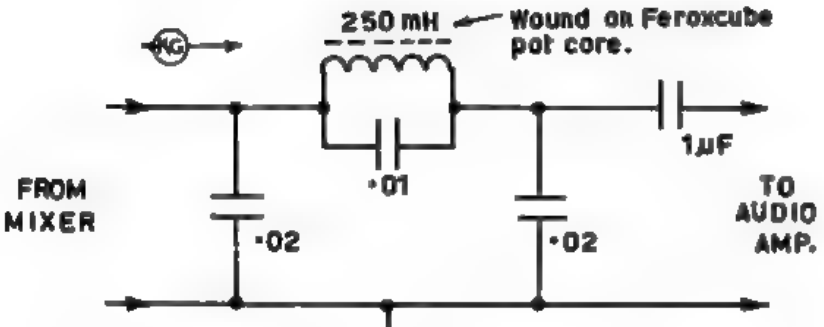


FIG. 6. LOW PASS FILTER

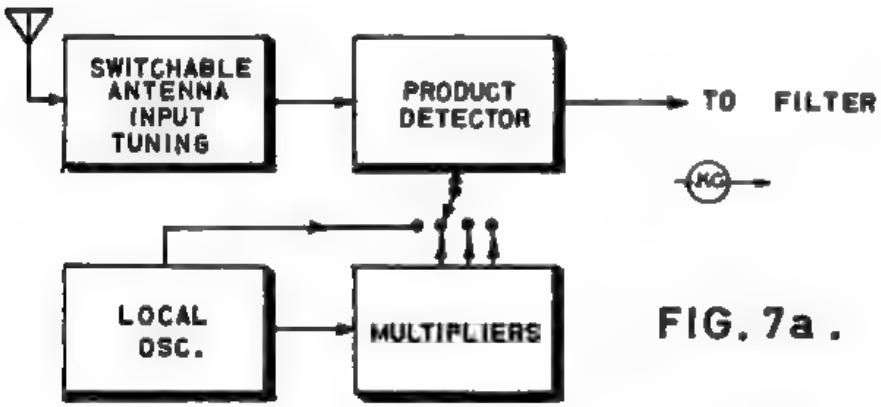


FIG. 7a.

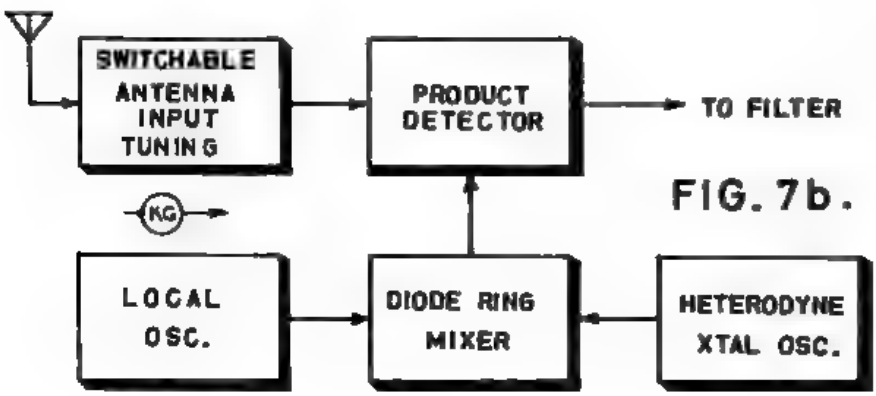


FIG. 7b.

Transceiver. The VFO is already there. All that needs doing is to add a buffer-driver stage and a PA. Key the buffer and the whole device works.

Now for a mention of CW before I conclude. If the receiver is to be built for CW only, then the filter can be designed differently. One or two filters in cascade tuned to 1 kHz would sharpen the signal greatly and take the place of the low pass filter, or its cut-off could be made about 1050 Hz and be followed by a high pass of 950 Hz, or the two combined.

For myself, I would leave the receiver as a SSB unit and switch a 1kHz peak filter in the audio chain. This could be passive or an active one. The latter would take less space and be more versatile.

That's it for now. At a later date I hope to write on a transceiver which will include receiver offset tuning, 16, virtually a necessity for such operation.

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CLUB/ZONE/DIVISION NEWS

● The Publications Committee wishes to advise that the call on AR for space to print material is so great it is not possible to include a section devoted to Divisional, Zone or Club news.

● Arranger ents were made with all Divisions that such news would appear in Divisional Bulletins if so required, and accepted by Divisional Bulletin Editors. Bulletins, when submitted, are carried as inserts in AR mailed to members of the Division concerned.

● It has been agreed however that AR should include an Events Diary to contain **very brief details** of forthcoming events. Items for this Diary **MUST** reach the Editor not later than the 1st of the month prior to publication.

the application of some *commercial kinks* to the FT 200

Maurie Evered VK3AVO

13 Sage Street, Oakleigh, 3166.

My early model FT200 was acquired in 1971 after I had previously used a Heathkit HX20 — HR20 combination. I was very happy with these but they were inferior to the FT200 with regard to selectivity, stability and the convenience of a transceiver. They did however have some advantages. Variation of the carrier level for CW operation, greater sensitivity on 15 and 10 metres (and I suspect even on 20 metres) and a delightfully smooth "S" meter movement. I have often likened the FT200 meter to a yo-yo the way it dances about. I will now describe how the application of some *"Commercial Kinks"* overcame these and other shortcomings in my FT200.

1. The substitution of a 10K ½ watt resistor for the RF choke L106 in the cathode circuit of the product detector V102a *(AR August 1972)*. This has removed the distortion from strong signals. I can now leave the RF gain control flat out even when Stan VK3AYF, my nearest Ham neighbour is operating.
2. The rewiring of switching to enable the AM Carrier Level Control to be operative in the CW position *(AR September 1972)*. This is a must if the 6JS6's are not to be overheated during prolonged CW operation. I consider this modification essential even if a fan is used to assist with the heating problem.
3. The connection of a 1000uF electrolytic capacitor across the S meter (not a 100uF as suggested in *AR December 1972;* this had virtually no effect in my case). This has resulted in a meter that is much easier to read particularly in the Receive and ALC positions.
4. The substitution of a 6GM6 for the 6BZ6 as the RF amplifier tube *AR December 1972*. This is a very useful modification and has greatly livened receiver performance on 20, 15 and 10 metres as judged by increased S meter readings on the crystal calibrator, and on local signals that I have noted before and after this modification. Previously the calibrator barely moved the S meter on 10 metres and only read S7 on 15 metres. Now it reads S8 on 10 metres and over S9 on 15 metres. I have copied 10 metre signals at readability 5 that I am sure would not have been detectable beforehand.

I have one last tip to pass on. If your FT200 suffers from intermittent **flat topping** and eventually from almost complete loss of output on all bands and modes, and if you are sure your driver and output stages are alright, watch for a defunct 6EJ7. This happened in my case. The location of this fault was revealed eventually by VK3OM's VTVM and RF probe. From all reports this mixer stage is usually trouble free and this type of fault can lead you a merry dance.

That concludes my remarks. I can only thank the author who brought these modifications to my notice in *AR* and say they have made a very good rig even better. ●

Maurie VK3AVO seated at his very neat station and using the FT200 modified as above.

Try This

with Ron Cook VK3AFW
and Bill Rice VK3ABP

TO PREVENT METAL FATIGUE IN BEAM ELEMENTS DUE TO WIND VIBRATION

Tie the ends of the elements to each other, using nylon fishing line. If the boom is made so that it projects beyond the furthest elements, the fishing line may then be "v'ed" in from the outer elements and the whole structure made rigid.

Pack the elements with sawdust; this tends to dampen out most of the vibrations without increasing the weight too much. The ends of the element should be plugged with wooden dowels or something similar.

Nylon or similar synthetic rope may be used to support vertical dural or aluminium poles carrying parasitic arrays. The supporting ropes of this type may pass between the elements without affecting the performance of the array as they have good insulating properties and are non-hygroscopic.

DRILLING GLASS

Another method of drilling holes in glass is by using triangular files in place of twist drills. Old files are broken up into suitable lengths. The pieces are ground at the narrowest ends and on the flat surfaces until one has a sharp three-cornered point.

Drilling is done in the normal way, but the glass should be reversed to keep the sides parallel in the finished hole. This should be done as soon as the point breaks through the bottom—this will ensure a neatly finished hole. The method was, and may be still, used in the glass trade. The lubricant, and/or cooling fluid, is water.

CLEANING AND KEEPING THE IRON CLEAN

A very useful item for this is that popular article of the kitchen, the pot scraper, which is usually made of steel wool.

Two or three are tucked into a small tin. The tin is then screwed to a piece of timber for support. The iron is inserted into the tin, a couple of twists and the iron is clean. Probably best done while the iron is hot.

BINDING MAGAZINES

Magazines may be bound into tidy volumes by the use of Cellophane (Scotch) Tape. One copy is placed face downwards, the other face upwards. With the backs edge to edge, place two or three strips of tape across the copies. Reverse the copies and repeat the process. Each succeeding copy is bound to its preceding copy in a similar manner. In this way one has a neat volume at the end of the year. An index can be drawn up from the contents page of each copy. Cheap, but handy!

These items originally appeared in AR, May 1954. Twenty years later they are still of interest. ●

jaunt to Johor

DAVID RANKIN 9V1RH-VK3QV
P.O. Box 29,
Pasir Panjant,
Singapore 5.

And so it came to pass that on the third attempt we made it.
third attempt!!!
we!!!
made it!!!

All good radio amateurs have more than a passing acquaintance with "Murphy" and his infamous law (no – not Senator Murphy this time). And everyone knows of course that "third time is lucky". The first attempt failed when two of our proposed party finished up with unexpected family commitments involving celebrations for the Chinese 7th month – the Devil Month. The second attempt never even got to the planning stage as our primary host was not going to be available. The third attempt was, of course, as in all good fairy stories, successful and so 7 a.m. on the 19th August we set forth from Singapore.

"We" consisted of Ebbey 9V1QG, Frank 9V1QG, Tan 9V1OD and David VK3QV 9V1RH. All of us are active members of the Council of the Singapore Amateur Radio Transmitting Society (SARTS) and the plan started out as a visit to Muar on the west coast of the state of Johor, West Malayasia. This plan in turn had arisen from an invitation from "Ray" 9M2TR to VK3QV when ragchewing on the air. None of the SARTS gang had met Ray and so it was decided to journey forth from Singapore through Johor up as far as Malacca to visit John 9M2GV as well. Unfortunately John had been ill and thus the journey was shortened to go only as far as Muar which is just south of the Johor-Malacca border and some 125 miles from Singapore.

Enroute to Muar we passed through the town of Batu Pahat and since the sun was high and hot it was decided to stop off for a short period and slake our thirst. Somebody then realised that Dr Ho 9M2DK lived locally. A glass of coke, a phone call and a short car journey later found the four of us in Kit 9M2DK's shack having a quick chat with Karel 9V1RO (VK6KE) on 7MHz. Kit and his charming xyl Ann pressed us to stay for lunch but learning that we were expected at 9M2TR, Kit suggested that we return to Singapore via Batu Pahat when perhaps we could all make a "small" side journey to Labis to visit 9M2SS. All agreed and 4.30 pm was the agreed ETA back at Batu Pahat.

Pressing on to Muar we finally made it half an hour late and despite the TH6 100' up we did not locate Ray's QTH straight away. Strangely enough, we later found that there were only three amateurs in Muar and that they all lived within ½ mile of each other. We had easily found the 9M2GA and 9M2DW QTH's but not 9M2TR. Murphy again!

Ray turned out to be His Highness Tunku Abdul Rahman, the son of Tunku Temangong of Johor Bahru, perhaps better known in Amateur circles as 9M2JB. Ray spent some of his schooling years in Perth and thus has a particular interest in Australian Amateurs. His contacts with Ray and Joan Beavers VK3BRB and VK3BJB respectively have already been the subject of Australiawide publicity in magazines (non Amateur) and ABC radio. Amongst the visitors at Tunku Ray's QTH was Tan 9M2DW one of the Old Timers of amateur radio in Malayasia.

After a luncheon of typical Malay dishes, discussion turned to topics of amateur interest. The 9M2TR shack was investigated and a great deal of attention centered on the magnificent locally built 100' tower. It was planted right in the middle of a rose garden. Ray's xyl Jackie must be very understanding as the roses got short shift when the tower was under construction.

Time was getting on and so after a quick visit to Tan 9M2DW's shack to see the gear and impressive aerial array, the SARTS gang took off to return to Batu Pahat and the 9M2DK QTH. Since we left Muar late, it was not to be unexpected that we arrived at Kit's place half an hour late. One does not drive at "the ton" on Johor roads. Nevertheless, life is of such a pace in this Region that half an hour one way or the other is "a small matter". Changing from our somewhat warm station wagon to the luxurious comfort of an air-conditioned Mercedes-Benz we were soon on our way again with 9V1RH operating as 9M2DK-Mobile. The FT-101 plus centre-loaded whip did a good job on 7MHz and a number of the 9M2 gang around the Penang area were worked. We also kept in contact with 9M2SS at Labis. The "short" side journey turned out to be a one hour jaunt of 60 miles – not much for a VK but quite a distance for the 9V1 boys.

Sangat, 9M2SS lived on a large plantation in a very, very quiet radio location. There was enough space for a number of rhombics, Vee beams, or other exotic curtain arrays but Sangat had none of these. The visitors agreed that this was a great pity and recommended to Sangat that he remedy the situation. 9V1RH even suggested he try a Beverage antenna for some 160 metre work.

Since it was now dusk and any hope of getting back to Singapore by 8 pm had evaporated, the 9M2 hospitality went into action once again. Sangat's xyl conjured up a meal as if by magic and a group of five visiting amateurs, 9M2DK's little daughter Happy, a neighbouring plantation manager and his wife, plus Sangat's family sat down to dinner around 8 pm.

Sangat was very sorry to see us go but the SARTS group had to return to Batu Pahat to pick up the station wagon before moving on to Singapore. We left Labis around 9.15 pm said our goodbyes to Kit at BP and started on the long way back to 9V1.

And so it was that around half past midnight four very tired but happy 9V1's crossed the causeway into Singapore, pleased to have

Batu Pahat — The shack of 9M2DK
L. to R. — Tan 9V1OD, David 9V1RH/VK3QV (on mic.)
Ebbey 9V1QG; Kit 9M2DK.

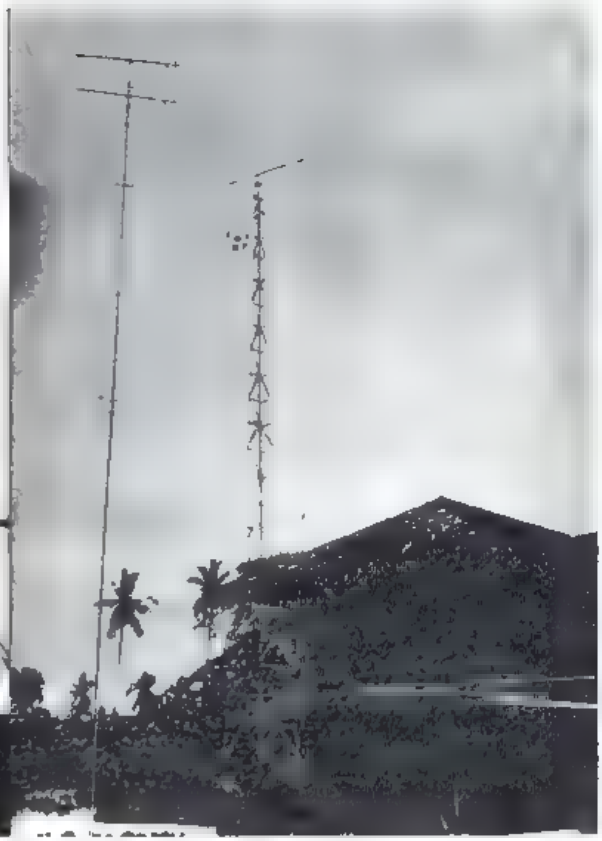
A small "hamfest" at Muar
L. to R.—Back: Tan 9M2DW; Tunku Ray 9M2TR, Tan 9V1OD
Front: Ebbey 9V1QG; Frank 9V1QK; David 9V1RH/VK3QV

met in person so many of their fellow Amateurs in southern 9M2 land. Their hospitality was as spontaneous as it was overwhelming and any Amateur visiting the area would no doubt be made to feel as welcome as the four 9V1's were.

A word of warning though — allow about one day longer to your planned stay in the area. Once those 9M2 boys get hold of you you'll find that you will need the extra time. They don't want to let you go too soon. ●

Mear—The antenna farm at 9M2TR. That TH6DX atop the 100' tower adds punch to Tunku Raya signal.

Mear—The 9M2TR shack with 9M2TR himself logging and 9V1RH supervising.



a series mode crystal oscillator

Ron Cook VK3AFW

Reprinted from the Victorian VHFer, August, 1972

An excellent circuit for series mode crystal oscillators is shown in Fig 1. This circuit was probably first developed by the Pye Crystal Division some years ago. It is reasonably tolerant of transistor parameter variations, mistuning and "high" loss or low activity crystals. Its similarity to the Colpitts circuit is quite evident.

I have used the following component values for crystals in the 70 to 80 MHz region:-

R1 = R2 = 6.8k	RE = 2.2k
C1 = 33pF	C2 = 10pF

L — set so that circuit oscillates on nominal crystal frequency with crystal replaced by a wire link.

Total current drain is 4mA.

Output can be taken on the fundamental from the emitter via an L network. Alternatively harmonic output may be extracted by a tuned circuit in the collector lead.

For use in the 40 to 50MHz region and with any transistor with an Ft of at least 150MHz, C1 should be 100 pF and C2 15 pF. Note that the largest capacitor is across the base-emitter terminals.

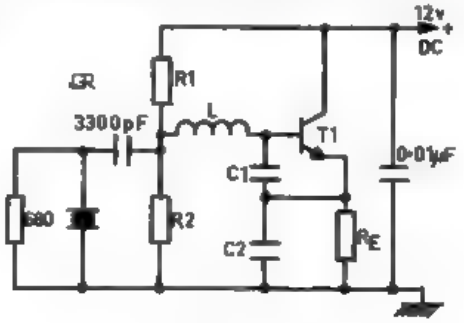


Fig.1 T1 - 2N918

These values have been calculated so that variations in the transistor's parameter (as do occur from device to device or with respect to temperature) are swamped out to a reasonable degree. The ratio of the values of C1 and C2 is such that it provides "matching" between the tuned circuit and the transistor input impedance and the resistance RE. Proper constraint on the ratio of the two capacitances is the minimum h.f. current gain of the transistor. In the values 100pF and 15 pF this is 7. That is, if the current gain exceeds 7 the circuit will oscillate. Lowering the value of RE increases the Gm of the transistor for R1, R2 fixed, but requires that C2 be increased. Thus the value of C2 exceeds that of C1. The minimum gain requirement of the transistor becomes easier to obtain in this circuit, i.e. lots of current feedback if C1 is reduced to retain a sensible value for L as C2 is increased. However, the stability of the output frequency suffers.

Tuned circuit design parameters

$$\text{crystal} = \frac{1}{\sqrt{L - \frac{C1 \times C2}{C1 + C2}}}$$

$$\text{Effective tapping point} = \frac{C1 + C2}{C1}$$

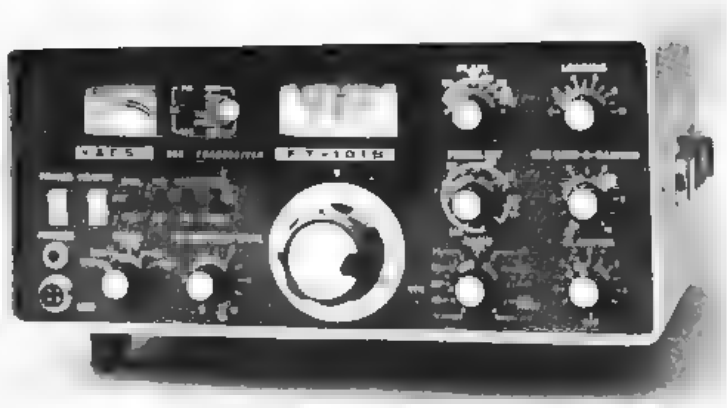
The crystal should be shorted by a few hundred ohms to ensure that it operates in its series mode. If the bias values are as recommended an additional shunt resistor is required.

The interesting point about this type of circuit is that the crystal behaves like a resistance of 10 to 50 ohms at several sharply defined frequencies (3rd, 5th, 7th harmonics). The tuned circuit selects the appropriate frequency. The tendency to drift higher is counteracted by the crystal appearing inductive on the high side of its resistance resonant frequency. It can be seen that an added inductance would pull the frequency lower and back to resonance. A similar capacitive effect stops the oscillator going low. If the circuit were to get very far off frequency the increase in the size of the impedance of the crystal would stop the circuit oscillating.

If you need a trouble free oscillator for a signal source or injection chain, a band edge marker, a transmitter master oscillator, or just want to see if that crystal of yours will overtone on its 7th harmonic, then try this circuit. ●

an AR special

a review of the FT101B



With the possible exception of the FT200 the Yaesu FT101 is the best known and most popular transceiver available on the Amateur market at the present time. Although the 101 has been available now for almost four years, no technical review has so far been presented in any of the popular amateur publications.

With the recent introduction of the FT101B, we obtained a sample from Bail Electronics in order to fully evaluate the new model, firstly in its own right and also in comparison with several aspects of performance of the earlier models.

TECHNICAL FEATURES. The FT101B, like its predecessors, is a six band transceiver with full coverage of all amateur bands from 160 to 10 metres including the 11 metre band. Except for the transmitter final and driver stages, all circuits are transistorized and composed of computer type plug-in modules. Both 240-115 volt AC and 12 volt DC power supplies are built in giving universal operation. Selectable upper and lower sideband, CW and AM modes are provided. An optional 600 Hz filter is available for CW operation. The transceiver includes as standard, VOX, break-in CW with side-tone, 25 and 100 kHz calibrators, noise blanker, and WWV reception on 10 MHz. A small speaker is also built in.

Externally the 101B differs but little from the earlier models. A panel light is now included to indicate when the internal VFO is operating, and a second light gives a warning when the clarifier is switched on, thus avoiding off-frequency operation. Both of these indicators are in fact light emitting diodes operating from the DC supply of the associated circuit

An optional feature on earlier models, the blower fan for the final compartment is now included as a standard feature.

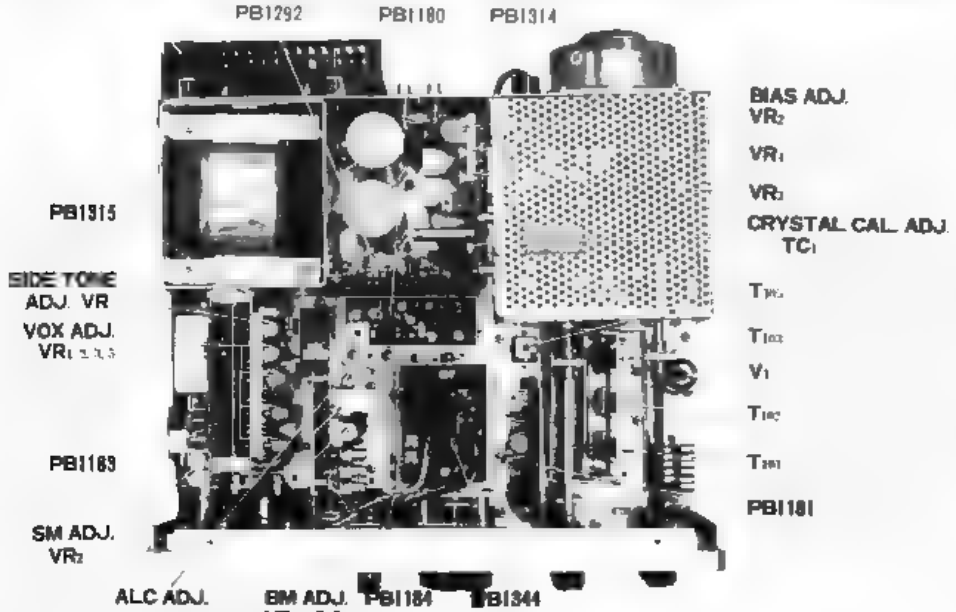
Transmitter driver and receiver front-end circuits are tuned with a permeability system very similar to that used by the Collins Company in their famous 75A and 75S receivers.

Padder capacitors are selected with the band switch to give the appropriate L-C ratio for the frequency in use. It would in fact be possible to tune to any frequency within the overall range to provide operation on commercial bands.

Several 101's are known to be in current use on these frequencies.

Several important changes have been made to components and layout in the new 101B. Whilst the circuit of the receiver front end remains the same, several components have been changed including the RF and second mixer transistors. These are now 3SK40M. Unfortunately no details are available on these at the time of writing. However, as we shall see later, they have improved the front end characteristics of the receiver to a marked extent.

A new sideband filter, with eight poles has replaced the six pole unit previously used, and a new noise blanker, now removed to the rear of the VFO on its own plug in board, has been included.



A top view of the FT101B with the case removed

THE FT101B ON THE AIR. Having experienced the front end overload and cross modulation on earlier 101's, the first test was to put the receiver on to 80 metres when plenty of locals were active. Try as I could, no cross modulation was heard. The previous model 101 was not happy with signals over S9 and use of the RF attenuator and RF gain was needed to restore the received audio to normal. All of this has been overcome and at no time was the attenuator needed.

In order to test the action of the new noise blanker, the 101B was installed on a speed boat powered with a large outboard motor. As any amateur who is also a boating enthusiast knows, these motors produce as much RF output as they produce horse power output. With the 101B tuned to the ten metre band and connected to a resonant whip for that band, the noise was running about 10dB over S9 on the meter. On switching in the blanker the noise dropped to S2 and allowed an S4 signal to be copied perfectly. Cross modulation with the blanker in operation was minimal, no doubt helped by the improved selectivity of the new filter.

Received audio using the internal speaker was reasonable considering it is mounted under the set and facing down. However a large external speaker is recommended for good quality reception Unfortunately we did not have the opportunity to test the matching Yaesu speaker

A much appreciated feature on these transceivers is a small dial light set into the main dial escutcheon immediately above the kilo Hertz dial. For night mobile operation and also for home use this light is a boon. Just why Yaesu have not incorporated this idea into their other rigs is hard to say.

Transmitter tune-up is quite straight forward and follows the usual procedure for present day rigs. After a short familiarisation period, the transmitter could be tuned spot on while talking just by watching the output

indicator or scope pattern. VOX operation has been improved with a longer delay time available. The microphone supplied with the 101B is a high impedance dynamic of the push to talk type. Although not tested separately, on air reports indicated excellent quality

Under test, we obtained the following figures from the 101B.

The receiver sensitivity was measured at 14.2 MHz. At .5 microvolt input from a Marconi TF 995A-5 signal generator terminated with a 50 ohm load a signal to noise ratio of 18 dB was achieved

The 'S' meter was also checked at 14.2 MHz.

S1 . . .	1.5uv	S8	25uv.
S2 . . .	2.0uv	S9	100uv.
S3 . . .	2.5uv	S9 plus 10dB	300uv.
S4 . . .	3.5uv	S9 plus 20dB	800uv.
S5 . . .	5.0uv	S9 plus 30dB	2.5mV
S6 . . .	8.0uv	S9 plus 40dB	10mV.
S7 . . .	12.5uv	S9 plus 60dB	50mV.

The input required to produce an S9 signal was checked on each band.

160 metres	100uv.
80 metres	100uv.
40 metres	100uv.
20 metres	100uv
15 metres	50uv.
11 and 10 metres	100uv.

The RF attenuator rated at 20 dB attenuation was measured at 18 dB.

VFO drift, specified at less than 100Hz per half hour, did not, in fact, exceed this figure over several hours operation.

Dial backlash was measured at just 50 Hz and the dial re-setability at about 150 Hz. As the 1kHz increments are rather closely spaced and the dial drive, whilst very smooth in operation, has a slightly spongy feel, it was not possible to set the dial better than the above figure. The dial lined up at each 100kHz point within the limits mentioned.

The response of the filter was measured as follows:-

300Hz...-6dB	1900Hz...-1dB
500Hz...-2dB	2000Hz..0dB
1000Hz...0dB	2200Hz . -2dB
1300Hz... +2dB	2500Hz...0dB
1700Hz...0dB	2700Hz... -6B

These are excellent figures and account for the very good audio on both transmit and receive. Outside the above, the response dropped off rapidly and slightly exceeded the makers figures. In use the receiver displayed no pop-ups at all outside the selectivity curve.

Transmitter output under CW conditions was measured at 14.2 MHz using a Swan ●M1500 RF power meter. 125 watts under steady carrier conditions was indicated with about 10 per cent more output under peak sideband conditions In-so-far as output is not specified by the makers, this figure appears reasonable based on the specified power input.

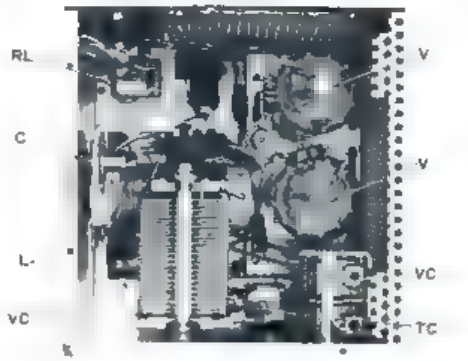
Checked from band to band using a Heathkit SB 610 monitorscope -, the output appeared to vary less than 10 per cent except on 160 metres where the output was down by 30 watts under steady carrier conditions.

Wave form on the scope with SSB output was excellent even with the ALC pushed somewhat above the recommended reading.

Here in Victoria, quite a few 101's are in use on the 160 metre band and as most of the activity is on AM, a good number of these are used in the AM mode. As received on an AM receiver the 101 has very much better audio than the usual run of sideband transceivers with 'single sideband AM' This is because the AM from a 101 is actually double sideband.

No figures were taken of the actual audio response but suffice to say the quality is very good.

A separate AM modulator is provided and the output of this is fed directly to the transmitter first mixer, bypassing the sideband filter.



FINAL AMPLIFIER COMPARTMENT

INSTRUCTION MANUAL. In the main this is well written, with a few notable exceptions. The operation of the VFO and clarifier indicator lights do not rate a mention at all. The actual frequency coverage of each band is not stated. Perhaps in most cases this is self evident but the specifications state coverage from 1.8 MHz whereas the actual coverage is from 1.5 MHz. This could prove embarrassing if transmission was attempted on the high end of the Broadcast band

The manual includes a very complete description of each plug-in module complete with a clear photograph showing all components. Basic alignment instructions and a full schematic diagram are provided.

In all, a manual that will give the 101B owner a clear idea of how his set works, and possibly enable him to clear simple faults if they occur.

The FT101B used in this review was provided by Bail Electronics Service, 60 Shannon Street, Box Hill North, to whom all enquiries should be directed. The present price is $579.

The published specifications are as follows:-

Frequency Range	1.8-30 MHz amateur bands (160 thru 10m) 26.9-27.5 MHz (CB) 10.10.5 MHz (WWV)
Type of Emission	USB or LSB (selectable)
Power Input	SSB 260 Watts PEP CW 180 Watts 50 per cent duty cycle AM 80 Watts (slightly lower on 10 meters)
Sideband Suppression	50 dB at 1000 Hz
Spurious Radiation	Down 40 dB or more
Transmitter Frequency Response	300Hz 2700Hz ± 3dB
Distortion Products	Down 30 dB or more
Antenna Output Impedance	50-75 ohm unbalanced
Frequency Stability	Less than 100 Hz drift in any 30 minute period
Sensitivity	0.3 uV S-N 10 dB
Selectivity	(2.4 KHz at 6 dB) SSB, AM, (4.5 KHz at 60 db)SSB, AM. (600 Hz at 6 dB) CW (1.2 KHz at 60 dB)CW
Audio Output	3 Watts
Power Consumption	AC Receive 35 Watts Transmit 300 Watts Max. DC 12V Standby 0.5 Amp. Transmit 20 Amps. Max.
Dimensions	13½ wide, 6" high, 11½ deep
Weight	Approx. 30 Pounds. VK3OM.

Afterthoughts

Page 5, JULY 1973, AR

Murphy struck again on page-18 of January 1974 issue of AR.

Component values for Fig. 1 are as follows:-

R1	**150K**
R2	**10K**
R3	**5.6K**
R4	**270ohm**
R5	**5.6K**
R6	**1.5K**
R7	**6.8K**
RV1	**22K trimpot**
Q1	**2N3565**
Q2	**2N4249**
Q3	**2N4249**
Q4	**RL20**

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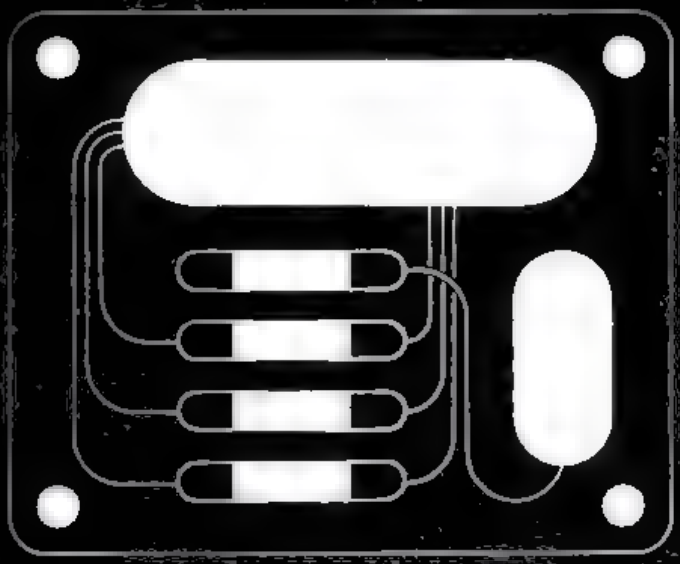

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award hunting - or the paper chase

Alan Shawsmith VK4SS

35 Whynot Street, West End, 4101

Award programmes and the consequent Hunting of Certificates began to mushroom around fifteen years ago and have, despite some criticism by a section of the fraternity, been responsible for a tremendous upsurge in activity on the bands.

It might be true to say that no single incentive, except DXing, has done more to put into positive effect the maxim — USE OR LOSE. This value should be borne in mind by those who see no merit in the pursuit.

No reasonable person would put the 'paper chase', diverse and varied as it is, among AR's top priorities or offer it as any reason or justification for our survival. But to say that such programmes are only a waste of time, IRCs or dollars, is to display the mentality of a cynic — one who knows the price of everything but the value of nothing.

In the minds of some the word HUNTING, as in AHC and CHC, seems to infer chasing wall paper certificates simply for their own sake. Without getting into the area of semantics I would agree that a more suitable word might be chosen. But what is a more fitting word? In an effort to do this and add status and discernment to their activities one club of German Hams have picked themselves the elegant phrase — DIG. Diploma Interest Group.

However, the fact is that most Hams ARE rather choosey as to what they want for wall decorations and as the natural order of selection progresses, will continue to be more so. There are of course compulsives in the ranks but these types exist in every other human activity outside of AR as well.

Another 'rag' that's chewed over with some argument is the worthiness or otherwise of this or that award. The critics claim the market is flooded with certificates of minor consequence. Here they have a point up to a point. It is true that there are too many trivial 'pieces of paper' in circulation. But again this same situation applies all over. There are second grade diplomas, certificates etc, issued for all sorts of achievements from a variety of places, such as colleges, universities, business houses and so on. Just as the cream comes to the top so too will inferior awards find their own level — at the bottom

However, one must be practical and realistic. Awards that are seemingly beyond attainment within a reasonable time dissuade rather than entice. In this way the humble certificate has its place, especially for the beginner.

In an effort to maintain a standard and balance, Award Hunters Club International has classified the market into OFFICIAL and NON-OFFICIAL AWARDS. The former are mostly those issued by IARU member societies and consequently acceptable to this Organization. Membership in AHC requires that an applicant possesses a minimum of ten OFFICIAL awards. However it is not to be taken that all NON-OFFICIAL awards are

Al, VK4SS, author of this and many other articles published in AR.

regarded as inferior by AHC. (Anyone wanting a list can have same by writing to VK4SS. OCEANIA SEC. AHC and enclosing a 9" x 6" SAE.)

It is well to keep in mind that the merit of a particular award is often hard to assess. For an individual Ham it can have a very subjective and personal value. For example, the ORIENT award or trophy would be a pushover for a JA but for a QRP Sth. American using the lower bands, it might represent the apex of attainment and be proudly pinned to the shack wall.

Another comment that continually crops up is that too many certificates are only in circulation because their sponsors seek a fast buck. This is said by those who have little or no knowledge of the 'paper chase.' Of course there are such awards in existence. It would be strange if AR was pure in this regard but they are really very much in the minority.

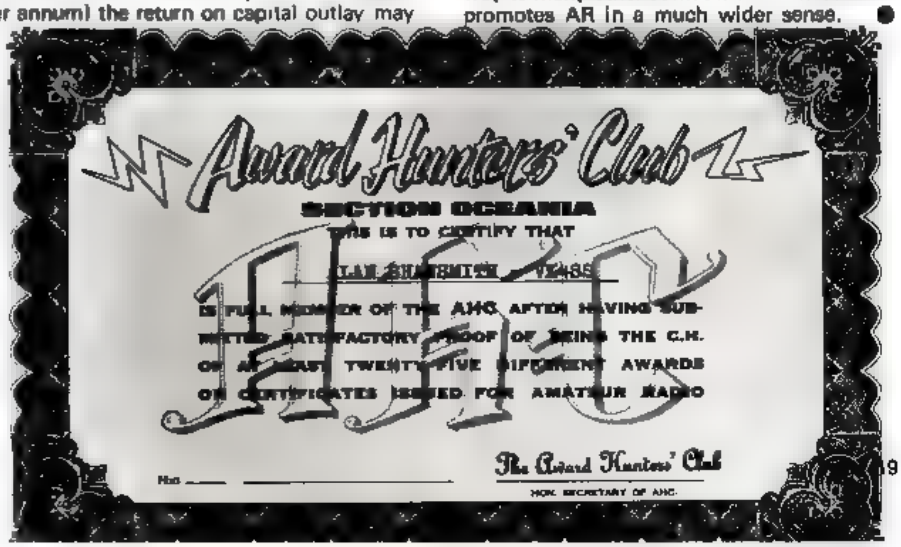
Printing costs are now no longer peanuts for anything that has quality, color and design. If a certificate, diploma etc. has merit and is difficult to obtain (say about 50 issued per annum) the return on capital outlay may not be recouped for many years. Hardly a fast buck. Add to this the rising cost in postage and other associated correspondence and the law of diminishing returns is soon evident. However awards issued for special events, National days or centenaries that attract a large number of applicants in a short time can be financially profitable for obvious reasons.

There are now supposed to be over one thousand awards, certificates diplomas, trophies etc. available throughout Hamdom. (Final figures are hard to come by). This means competition has become a new scene altogether. Creators of new awards must now come up with that something EXTRA in quality, merit and individuality. Awards also need a National flavor and IARU acceptance if possible. This can't always be done but even so the humble private club certificate is improved by an uplift. The single and simple criteria — work five members — is beginning to sound like a worn '78' and old hat. A few added requirements, such as multiband operation, dual mode, points for DX etc. help raise the status.

The 'paper chase' continues to draw ever more participation. One reason for its popularity is because it satisfies and provides an outlet for a still persistent atavistic urge that modern living tends to frustrate and suppress. The big event in the lives of our primordial ancestors was the hunt, the chase and the capture.

Call at a DXers shack. See his beam slowly turning, searching; then go inside and watch him crouched in front of the receiver, eyes glued to the dial as if to bore a hole in it and hand on key or mike. Sublimed and civilized by modern society it may be but he is nevertheless acting out the irristible hunting hang-up bestowed on him by his forebears half a million years ago!!!!

Award Hunting is more than a self-interest fun game. This description sells it short. No activity is an island unto itself. Everything has some spin-off. The 'paper chase' demonstrates skill and achievement, regenerates on-air activity thus opening the way to many other contacts and interests and promotes AR in a much wider sense. ●



modifications to Sakura model TR-65 circuit tester (multi-meter)

C. P. Daw VK2AGJ

"Woodlands", Wombat, N.S.W., 2595.

A common problem with numerous commercial multimeters is their sensitivity to stray RF fields on other than the AC voltage ranges. This is particularly annoying when trouble shooting on transmitters and TV receivers. VK2AGJ describes here a simple modification to overcome the problem in at least one such meter.

I found this instrument, in original state, of very limited use since it was prone to false readings where there was any RF present. My first thoughts were that bypassing or incorporation of RF chokes might help but this did not work.

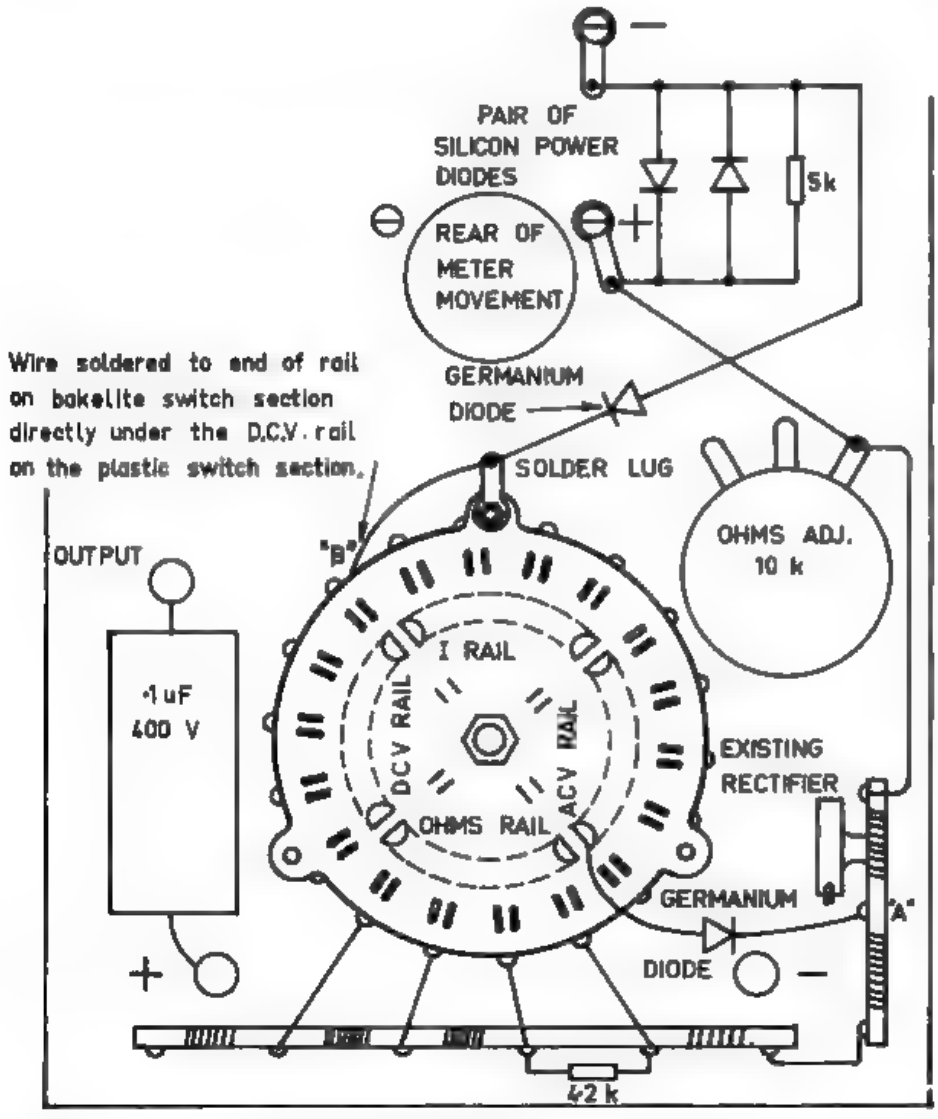
Examination of the circuit indicated the problem was caused by the AC rectifier being permanently connected across the meter movement on all ranges. The next idea was to incorporate a switch to disconnect the rectifier for all but the AC ranges. I investigated fitting a switch potentiometer (switch for switching rectifier and potentiometer for ohms) in place of ohms adjust but abandoned the thought since a switch potentiometer of suitable physical size was not available at the time.

Careful examination of the range switch in the instrument revealed that there were three unused segments (corresponding to the second segment used on the ohms range). A little thought indicated the segment opposite the AC volt "rail" could be used to switch the rectifier in and out of the circuit provided the original selenium rectifier was replaced with two individual diodes. I replaced the rectifier with two OA85's (OA79, OA81, OA90, OA91, OA95 would do) and the accuracy of the AC ranges did not seem to be affected by the change.

The next problem was gaining access to the appropriate segment of the switch. Care is necessary in removing the two switch mounting screws since they have been locked with paint. Remove the selector knob. Some components have to be unsoldered from the switch and the switch eased up until a small soldering iron can be got to the appropriate segment where it bends over on the opposite side of bakelite to where the switch wiper travels. (Side closest to front panel). Solder a flexible lead of appropriate length to this point. The switch is now re-assembled. An anchor point is required where the other end of the new lead joins one of the diodes. I provided this with a solder lug under one of the switch bolts (note these bolts are interconnected with the other two via the switch frame).

Disconnect the original rectifier and install two germanium diodes as shown in diagram. I also installed a pair of silicon power diodes connected in opposite directions across the movement for overload protection. The switch position may need adjusting (mounting holes are slotted for this) so the knob lines up with the range indications.

This modification has eliminated the RF problem and may be adaptable to other makes of meters which are similarly affected. ●



Resistor strip "A" centre terminal originally soldered to lower rectifier terminal. Unsolder and bend terminals so they do not touch. Strip is left supported on its connecting leads. Wire from centre terminals of rectifier and end of AC volt rail removed. Germanium diode wired from AC volt rail with polarity shown to centre of resistor strip "A". At point "B" wire has to be soldered to end of rail on front panel side of bakelite switch section since slider of switch has to slide unimpeded on other side.

ZR CALL SIGNS

The Aug. '73 issue of *Radio ZS* carries a letter from their PMG authorising the issue of restricted licences to anyone who, "except that he did not pass the morse test, would have qualified for the issue of an amateur licence." Such licences will be issued in the ZR-series and communications are restricted to 144MHz or higher. They will not be permitted to operate through satellites if part of the communications link operates below 144MHz. Any ZR licensee can convert to the full ZS call on passing the morse test but will have to use CW below 144MHz for his first year as a ZS in the same way that all other ZS licensees have to qualify before using telephony.

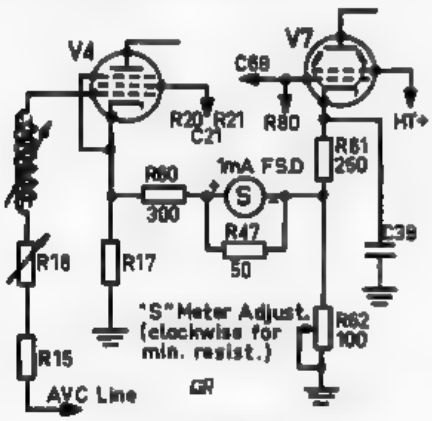
Commercial Kinks

with Ron Fisher VK3OM
3 Fairview Ave., Glen Waverley, 3150

THE AR7 (Part three).
This month a few simple modifications for your AR7.
The first was described by Gordon Bowen in a series on the AR7 published in AR back in 1957.

AN ANTENNA TRIMMER FOR THE AR7. Drill a hole in the front panel, at the same level as the noise limiter control but on the left hand side of the tuning dial, to take a small variable capacitor. Any type will do here, but it should have a maximum value of 100 to 150pf to be able to accommodate the change across the tuning range. Connect this across the coil, not across the gang, and when re-aligning these stages set the trimmer to about half capacity. You will now be able to keep the RF stage peaked at all frequencies throughout the tuning range with a definite improvement in sensitivity.

A further improvement in both gain and sensitivity can be made by substituting a modern tube in place of the original 6U7G. Back in 1957, Gordon Bowen suggested using an RL7 or EF54. However, today, other types come to mind like the 6EH7 which has a Gm of 11000. A word of warning — leave the 6U7G in the second RF stage. As the tuned circuits associated with this stage have been designed to match the high impedance input of the 6U7, a better 'Q' and hence better image rejection will result.

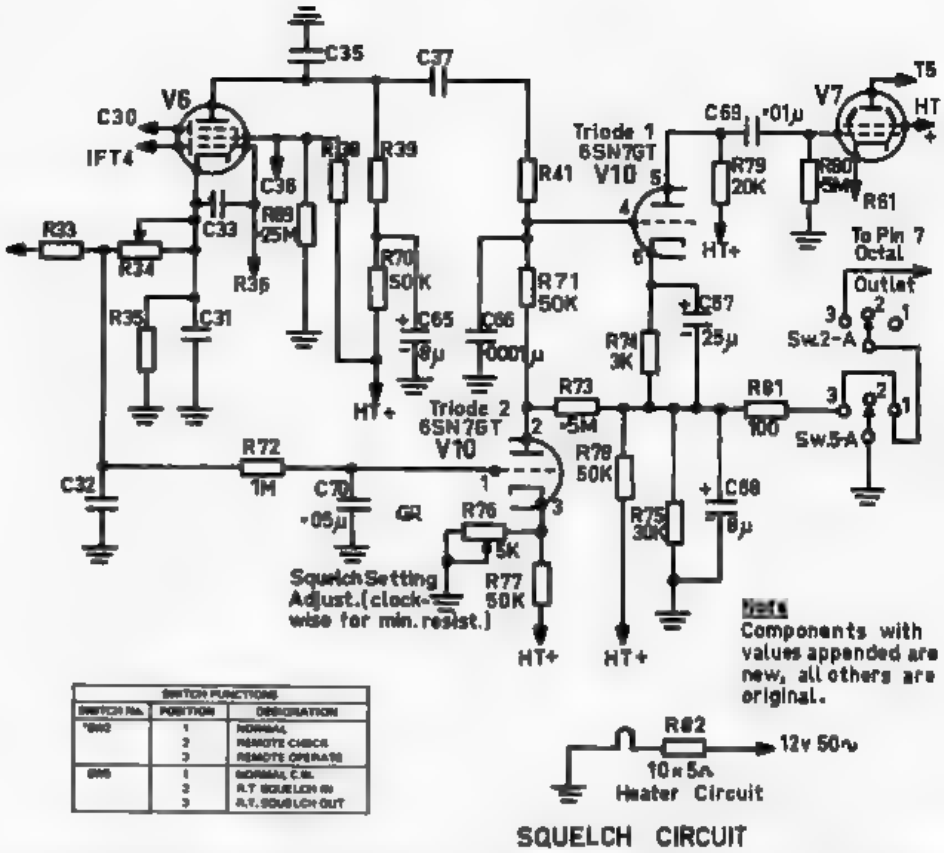


"S" METER

POWER SUPPLY. If the original power supply using the pair of 6X5GT valves is still intact, the high tension supply is very stable and there is no need for a voltage regulator. However if your AR7 has a typical "hum" built power supply a voltage regulator should be included to stabilise the oscillator HT to 100 volts.

IMPROVED BFO. Better BFO stability can be obtained by modifying the original to the circuit shown.

One half of a twin triode 6C8G tube is used in a series electron-coupled Hartley circuit as the beat frequency oscillator. Control of the BFO is achieved by means of a reactance tube using one half of a twin triode 6SN7GT tube connected across the tuned circuit of the BFO.



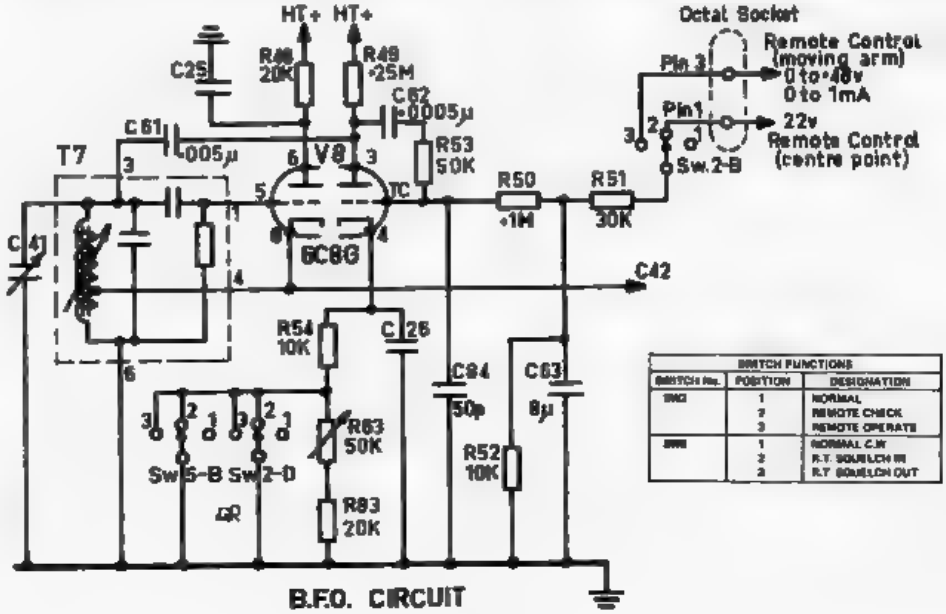
SWITCH FUNCTIONS		
SWITCH No.	POSITION	DESIGNATION
SW2	1	NORMAL
	2	REMOTE CHECK
	3	REMOTE OPERATE
SW5	1	NORMAL C.W.
	2	R.T. SQUELCH IN
	3	R.T. SQUELCH OUT

Note
Components with values appended are new, all others are original.

SQUELCH CIRCUIT

The effective shunt reactance thus added is dependent upon the grid-cathode potential of the reactance tube and so the frequency of the BFO may be varied by changing the voltage applied to a control line which feeds a voltage divider in the grid circuit of the reactance tube. A certain negative voltage on the control line will result in the BFO operating at 455 kHz, giving zero beat on the CW signal; an increase or decrease in voltage causes the BFO frequency to shift, with corresponding change in beat note.

Provision is made for operation of the receiver under normal conditions, i.e., full manual control. For "normal CW" (i.e., both SW2 and SW5 set at position 1) additional resistance (R63 and R83) is inserted in the cathode of the reactance tube to give a grid bias equivalent to that present when on zero beat with remote control. For all other conditions, including "normal R.T." operation this cathode resistance is shorted out. When "normal R.T." is used, there is also no external voltage applied to the reactance tube grid (the BFO control line being opened at SW2B), so this tube draws large current and BFO is rendered ineffective, its output being greatly reduced and frequency shift increased



SWITCH FUNCTIONS		
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B.F.O. CIRCUIT

so that the resultant beat note is beyond audibility.

No doubt many AR7's in use today are serving as IF strips for VHF converters or perhaps for HF net operation on 160 metres or other bands. Therefore the inclusion of a squelch circuit could be of great value. One half of a 6SN7 is used

The rectified carrier appears across R33 and R34 This is applied to the grid of triode 2 of V10 through an RC circuit. The cathode of triode 2 is set by a potentiometer located in the former "Noise Limiter" position. This control is set so that an increase in the signal gives additional negative grid bias on triode 2 sufficient to cut off the plate current. This plate current flows through R73 which appears also in the grid circuit of triode 1 Triode 1 is an audio amplifier connected between the 6G8G (V6) and the 6V6G (V7). In the normal "no-signal" condition, triode 2 draws plate current and biases to cut off triode 1 An incoming signal removes this bias and the signal is delivered to the output circuit

Provision has been made for local or remote control of squelch operation as required. For in-out switching of squelch, the junction of R75 and R78 is taken, via R81 to SW5A, and also to pin 7 of octal outlet, via SW2A. When this point is earthed (either locally by setting SW5 at position 1 or 3, or remotely after SW2 is set at position 3), triode 2 of V10 cannot draw plate current to cause cut-off condition in triode 1 of V10 and so silencing occurs. R81 reduces rate of discharge of C68.

Remote in-out switching of squelch is obtained by earthing pin 7 via the control line

That concludes this series on the AR7. However, if you have any ideas that you have tried and proved, do not forget to let me know. When it comes to modifications and improvements, the subject is never closed. ●

QSP

EMP

"Ever hear of it?" asks WINJM in Sept. '73 QST Emergency Services column. "It stands for Electromagnetic Pulse, and is a phenomenon which results from a nuclear burst. Basically EMP has an effect similar to lightning but is not the same thing as it is caused by sudden release of nuclear energy. The EMP effect of a high altitude burst can extend thousands of miles beyond any of its other effects, possibly causing burnouts in unprotected communications equipment over such an area. EMP could wipe out much of our communications, especially our amateur communications just when it is most needed. Any piece of radio equipment using an antenna over four feet long is subject to burnout by EMP. So there you have it, a threat to communications that most of us never knew existed. Nothing is more susceptible to EMP (and lightning too, for that matter) than a repeater."

AUSTRALIAN STANDARDS.

The Standards Association of Australia has been busy lately on a number of revised and new standards affecting radio and similar components and accessories. A.S. 1042 (revises A.S. C42 1964 metrically), deals with electrical meters, definitions, classifications, permissible errors and reference conditions, variations, markings and so on. It extends to accuracy concepts as well as shunts and so on. Another, AS1127 Part 4, deals with dimensions of loudspeakers to facilitate rationalization and mechanical interchangeability. In continuation of AS1099 is another series of standard tests including two water-bath methods which obviously do not refer to the cooling of linear finals. Earlier standards published this year include AS1381 on fixed capacitors and amendment 5 to the Wiring Rules

Intruder Watch

with Alf Chandler VK3LC

1536 High Street, Glen Iris. 3146

Just received a list of active Intruder Watch observers in the USA — 525.

There are 15 active in VK. Pity we cannot get more to take an active interest in this crucial activity. It doesn't take a lot of time, nor does it take much energy — just report when you hear and identify an intruder. There are plenty in our bands. The identification tape has been played over the different State Sunday morning broadcasts quite recently and, if you require it, it could be played as often as necessary. Any Member wanting a copy can obtain one from me by submitting a blank reel or cassette. How about it? In the December issue of "QST" is a story by W1NF about Intruder Watching. It is good reading and well worth while your study. Since the summary displayed in the January issue, the following are some stations that have been reported. —

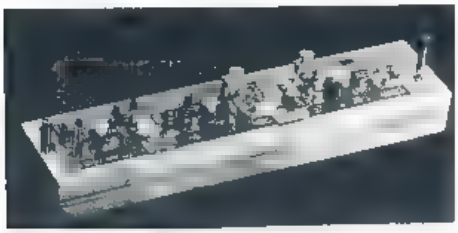
14000-14200	A2	Jammer — a whizzing sound spreading across the band
14010	A1	F7A calling TBO
14103	A1	TBO calling F7A
14023	A1	XBP sending calls only.
14039	A1	PBy sending calls only
14075	A1	OJY calling ALT
14079	A1	WUF sending calls only
14100	A1	PJN calling BRA.
14122	A1	KLW using continental morse
14133	A1	SPH sending Vs and calls spreading from 14128 to 14138.
14288	A1	NDT-NPO-NPN calling GMV
14293-14298	F1	RTTY stations signing HMB22 HMD7 HMD8, HMY26 in Korea and ZEO66 in Hong Kong. Read-outs have been submitted
7019	A1	HMF21, HMR56 HME28 HMK31 signing freq 11230-7015-13780-9404 Pyong yang

Keep these sort of reports coming in!! ●

VHF ENTHUSIASTS—

30 Watts at 150MHz from 12.6V Supply

Did you see the review in Electronics Australia? In January's issue Jim Rowe gave a full treatment to Dick's VHF Amp and it came through with flying colours.
Contrary to rumour, the price won't be going up just because we're famous, but there's bound to be a lot of demand for this Superkit so place your order now!



3 STAGE KIT

Full instructions are included (we hope also to supply reprints of E.A. article). Power transistors circuit boards, special trimmers etc. (All P & P 50c)

7W stage using 2N5589 complete kit	$11.50
15W stage using 2N5590 complete kit	$13.50
30W stage using 2N5591 complete kit	$17.50
Circuit boards each stage (state which)	$1.50
Single board for 3 stages	$4.20
300mW in 30 Watt out	$37.50

COMPLETE KIT SAVES YOU $5.00

Transistors available separately. Will withstand severe VSWR. Low inductance stripline package. Isolated stud. Over 4.4db power gain.

2N5589	$6.50
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2N5591	$9.85
Set for	$22.50

Full data in our catalogue or sent with your order if requested

KITS FOR THE AMATEUR — FANTASTIC VALUE — PROFESSIONAL RESULTS — SPECIALLY SELECTED

Here are our three popular digital kits for the serious amateur. Most enquiries show that customers don't believe we can supply a complete kit at such a low price. We do it by concentrating on a few good kits rather than heaps of mediocre ones. So read on

A REAL LIVE WORKING 200MHz COUNTER FOR ONLY $135

The circuit was in Electronics Australia in December. Fully solid state with latest MSI ICs and LED readout. Uses 23 ICs so that it is straightforward and quick to construct and very economical. Like the article our kit is in two parts. Basic 4½ decade, 20MHz counter complete with crystal and handsome painted metal case **$116** (P & P $2.00) or complete with 200MHz prescaler for only **$135** (P & P $2.00)

THROW YOUR MULTITESTER AWAY AND BUILD A 3½ DIGIT VOLTMETER

This one has been very popular since E.A. featured it in October. Uses the fantastic Analog Devices digital panelmeter (also available separately for **$102**). Max error is only plus or minus 0.05% plus 1 digit. Ranges from 200mV to 20kV and 20 ohm to 200k. Full kit for this beauty is only **$145**. (P & P $1.50)

EAT THE CUCKOO FOR LUNCH AND BUILD YOUR OWN DIGITAL CLOCK

We don't have to tell you the advantages of a digital clock do we? Has been a popular kit since it was in E.A. last September. Uses a special offer pack from Sperry/National consisting of 24 pin IC clock chip and Sperry flat readout which can be read from 40 feet away. Our kit also includes 13 transistors 2 PC boards etc. In fact everything but a case, since there are so many different ways to build it, all for **$49.00**. If you're really quick we have about 10 of the special offer IC/Readout packs left at **$26.75** (Both P & P 75c)

BOOK SECTION EXPANDING

In addition to a wide range of Howard Sams and ARRL books which we are importing, we can now offer an excellent selection of McGraw-Hill books for both professional and amateur. Ask for our booklist

DSE

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good quality cw from the 122

R. D. Champness VK3UG

44 Rathmullen Road, Boronia.

The 122 transceiver has been the subject of many modifications since its release on the surplus market, soon after the end of WW2. The 122 is not much heard of in these days of the super dooper extra special signal exhalers called SSB transceivers. You will hear my 122 underneath the S-9 splatter occasionally, and putting out quite a respectable CW signal, even if at times the CW ability of the operator could be in doubt.

The quality of the CW signal from an unmodified 122 on 80 metres is far from T9 and on 40 metres it is in the region of T3 to 4. This rather perturbed me so I set about improving the stability of the transmitter frequency during keying. The biggest problem is the fact that the VFO is keyed on and off whenever the morse key is used. If the VFO could be left operating whilst only the 807 output was being keyed I might have some success at getting rid of the severe "chirp".

I worked along these lines and came up with quite a simple modification. The additional parts consist of 2 — 400PIV diodes (or higher voltage) and one 5.6k ohm ½ watt resistor, a few inches of hook up wire, some insulation tape, and patience. You will need to consult the set circuit, and figure 1 shows the particular section to be modified, in its unmodified condition. Figure 2 shows the modification.

The actual surgery takes place on the front of the first tag board immediately behind the mode change switch. With the set turned upside down you will see three red wires terminating onto one lug along with one end of R18A. Two of the red wires are lifted off this tie point — but which two? Lift off all red wires to start with. Then check with an ohm meter between each red wire and the end of the resistor R18A. The mode switch must be in the R-T or MCW position. One wire will show about 5000 ohms when tested this way. This wire, which is the only one which should show continuity, is rewired to the solder lug tie point. A diode is now wired from the tie point to the other two red wires. The other diode is wired with a resistor in series to the transmitter HT supply which is probably most easily picked off on the metering switch from the H.T.S. position.

Your set is now modified and should perform quite satisfactorily on CW, providing you have put tape and insulating sleeves over the newly added components. The 122 is not exactly the easiest of sets to work on as the components are crammed in. If you can fit a tag strip in all to the good, but I did not think it was necessary.

How does this modification work? When the transceiver is in the transmit condition HT is supplied to contact 21 relay No. 2. This is supplied via D2 and R100 to the VFO but is blocked from the PA by D1. This is the transmitter section switched on but not transmitting. Now when the morse key is pressed Relay 2 will operate closing contacts 21 and 22. HT is supplied to the PA and the VFO via D1 (mostly). As soon as the key is released the PA is cut off again but the VFO continues to operate until the transceiver timing circuit changes the set over to receive. When this occurs there is no HT supplied to the transmitter HT line and the VFO is off. Carefully looking at this circuit it will become

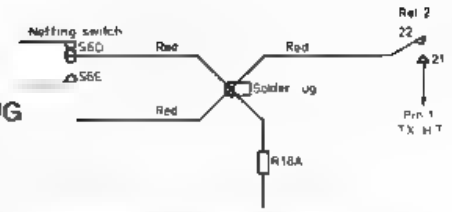


FIG 1 UNMODIFIED CIRCUIT OF 122

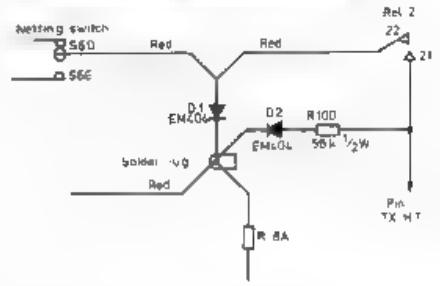
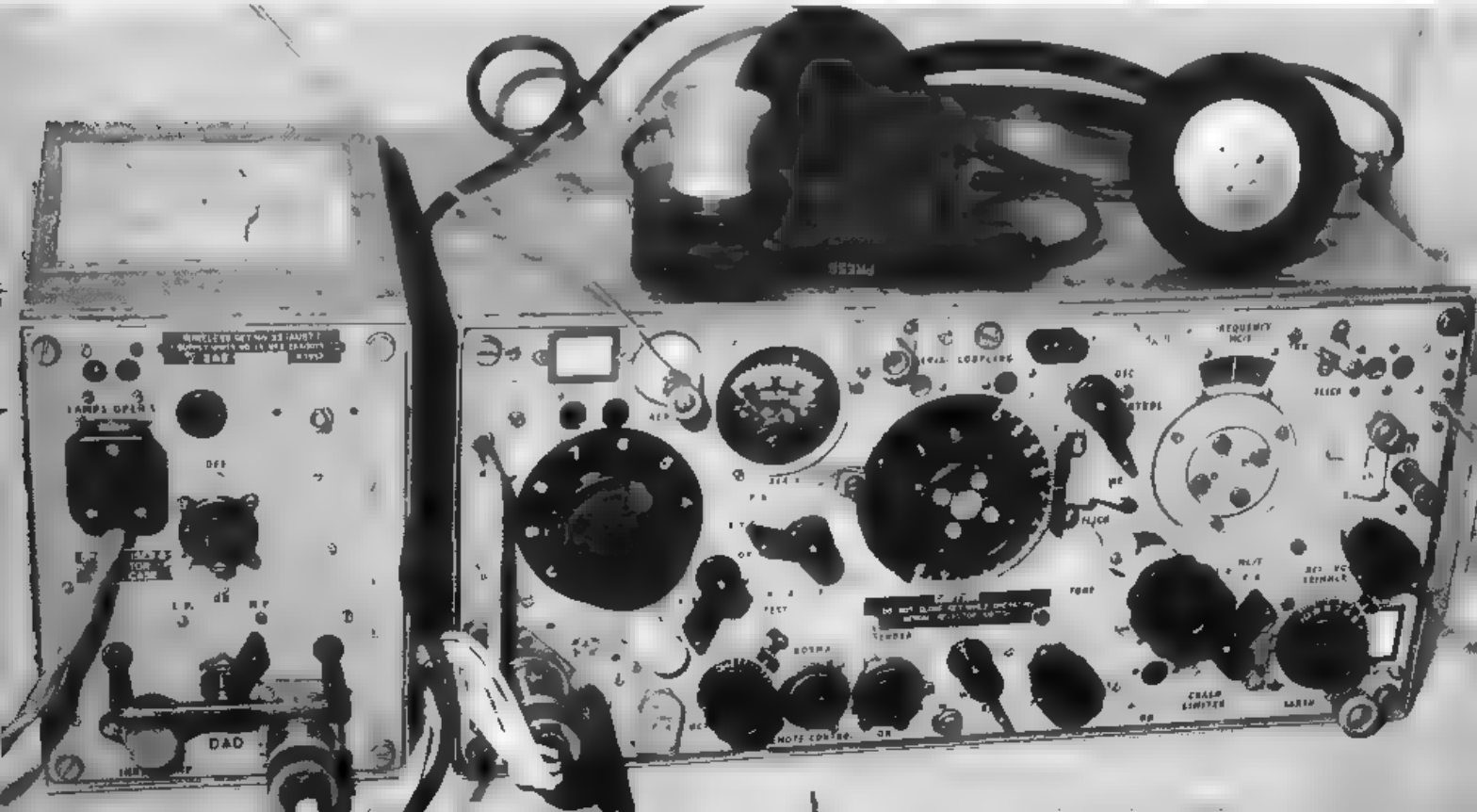


FIG 2 - MODIFIED CIRCUIT OF 122

obvious that diode D2 doesn't do anything!!! Consider, though, contacts S6D and S6E which are part of the netting circuit. Contacts S6E connect back to the receiver HT and provide enough voltage for the VFO to give a satisfactory netting signal level. S6D isolates the rest of the transmitter when this takes place. So that additional loading on this line does not take place, diode D2 isolates the VFO from the main transmitter HT line. That about wraps up this simple but effective modification.

I have further thoughts on modifying the wiring to the mode switch so that when I switch to MCW position I still transmit phone and receive SSB. It would be much easier than changing over the mode switch when going from AM transmit to SSB receive. ●



Newcomers Notebook

with Rodney Champness VK3UG

44 Rathmullen Rd., Boronia, Vic., 3155

PRODUCT DETECTORS FOR YOUR RECEIVER

A product Detector is used to resolve single sideband transmissions and morse code transmissions of the A1 type mode. Many of the older sets have a BFO and inject the output of it into the diode detector or rely on stray coupling into the IF to produce a "Beat Frequency" with the incoming morse signal. I deliberately said morse signal, because most of the earlier sets were designed before SSB became at all well known. The ratio of the BFO and incoming signal was not set at any particular level. Use of the receiver RF control was necessary and AVC or the later AGC could not be used as the BFO signal got straight into the IF channel of the receiver. There it was rectified like any other signal so causing, in most cases, a large AGC bias voltage to be developed, which de-sensitized the receiver. A very decided disadvantage. It would be most convenient if the BFO signal could be kept out of the main IF channel so that the strength of the incoming signal controlled the gain of the set and hence the level of the audio output on both CW and SSB. The relative level of BFO signal, or as it is more commonly called Carrier Insertion Oscillator signal, to input signal should be about 10 units of Carrier Injection Level to 1 Level of input signal, for best intelligibility.

It is not at all easy to obtain anywhere near this optimum level of signal difference for SSB with the BFO signal being injected straight into the detector. In fact it is downright cumbersome to handle if fading is about or signals are weak or too strong. Now enter the Product Detector. The Product Detector, if shielded properly and electrically adjusted correctly, will easily out-perform the earlier BFO-diode detector arrangement. In the circuit shown using the 6BE6 valve the operation of the valve is similar to its operation when used as frequency converter in any ordinary receiver.

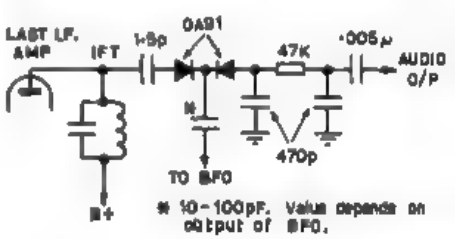
The valve in fact acts like an electronic gate. The carrier oscillator section uses the 1st grid, cathode and screen grid as the three terminals of the oscillator. The SSB or CW signal is applied to the 2nd grid and the plate current of the valve is controlled by the combined efforts of the signals applied to the two input grids. When they are in phase the plate current will show either a peak or null greater than if the signals are out of phase with one another (180 degrees phase difference). If, say, your Carrier Insertion Oscillator is set at 455kHz and the Single Sideband Spectrum is from 455.3kHz to 458kHz. The Sideband Spectrum has a frequency difference from the Insertion Oscillator of 300Hz to 3,000Hz. The output from the product detector contains this audio spectrum, plus the two RF signals, the local oscillator and the frequency converted signal frequency which is now at IF frequency. The plate circuit of the 6BE6 is however only suitable for audio frequencies, and as such only passes the 300 to 3000 Hz range of frequencies that are produced in the Product Detector. Looking at the inputs to the 6BE6 you will notice that they are all RF circuits and the output is the normal audio style circuit Only audio is fed out of the stage after the low pass filter which consists of two 0.001uF capacitors and one 10k ohm resistor.

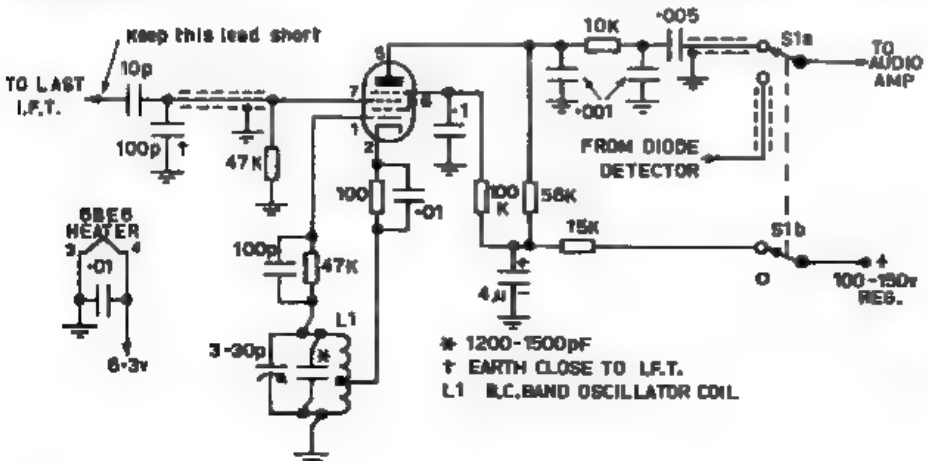
The construction of this Product Detector is not unduly hard. If you are converting an old domestic mantel set for SSB reception I would recommend that this unit be built separately to the receiver unless you have a reasonable amount of room inside. If you are converting an old diode injection BFO style receiver you can either build the unit into the receiver or externally if shielding of the Carrier Insertion Oscillator section of the Product Detector appears to be a problem. I would stress that bottling the CIO up is most desirable so that its output can have no effect on the receiver AGC network. I would suggest that the unit be built in one of the die-cast boxes readily available from advertisers in AR or some other similar shielded box. The valve itself will be mounted out of the box so it will be necessary to have a valve shield over the valve so that little RF escapes from the valve envelope

There are 4 leads plus an earth coming out of the shielded box. The shield braids should go to an earth lug just inside the box. The HT line should have the 15k ohm resistor mounted just alongside the hole that the HT lead goes out of. The heater lead of the valve should have a 0.01uF or similar capacitor to ground where it goes out of the box too. Very little energy should escape to cause trouble. The shielded leads should only be earthed as shown and desirably the cables can be fairly thin audio coaxial cable with a plastic outer sheath. The only components of particular note are the coil-capacitor arrangement. The coil is a normal local oscillator coil out of a typical mantel receiver using a 6BE6 converter. To get it down to 455kHz it is necessary to shunt it with about 1200 to 1500pf The trimmer capacitor is just to do fine tuning on SSB signals and tune for USB or LSB

It isn't too hard to adjust this unit. Tune in an SSB station and slowly adjust the coil slug until the signal is resolved. The small trimmer should be at half capacity when this is being done If the signal cannot be resolved alter the value of the 1200 to 1500pf capacitor a hundred or so pf until it resolves SSB signals. If still no joy, make sure that the CIO is in fact working. To do this, lift off the earthy end of the 47k ohm resistor going to pin 1 of the 6BE6. The earthy end is the coil end Place a 1ma meter in series with this lead with the positive probe going to earth. A reading of about 0.2 to 0.3ma should be read. Incidentally this end of the resistor doesn't have to attach to about a volt is measured. If all of these seem okay make sure you have wired the coil in correctly so that positive feedback does occur in the oscillator circuit.

Kevin Plew of Drouin supplied me with the information on this Product Detector which he has used in his communications receiver successfully for some time now. This circuit has been around for a while, but Kevin's idea using the old BC set local oscillator coil saves trying to buy a hard to get 456kHz oscillator coil. The following Product Detector was also suggested by Kevin and has been used by Albert Cash of Morwell in his AR88 receiver.





Thank you to Kevin and Albert for the information supplied, which is most gratefully received.

A very simple method of modification to almost any receiver for the resolution of SSB signals follows. It consists of two OA91 diodes or similar, a few capacitors and resistors, plus a small tagboard if it is made in the same way as I made it. This would be a simple project for a beginner in electronics. It would give a lot of satisfaction once completed as it works well. I have this in my AR88D and I can sit back and enjoy armchair copy on SSB without having to chase it around with the BFO. The receiver RF gain needs no adjustment compared to copying SSB with the AM detector and the BFO. This circuit has been published quite a few times in amateur radio magazines — so it

is not new. It is a good exercise for a newcomer to radio.

Your own ideas about switching from AM detection to Product Detector can be worked out yourself. One other point. If the AGC decay time is too fast and causes pumping, a 1uF capacitor across the AGC line should cure that. Try it — it is easy.

To switch to AM one of the diodes could be shorted by a switch. Good shielding is still necessary with this circuit if operation as Albert describes it, is to be achieved. Next month — equipment layout ●

Letters to the Editor

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers

5 kHz DEVIATION FOR AMATEUR F.M.?

In frequency modulation, the modulation index is defined as

M - peak deviation from carrier frequency
modulating frequency

For amateur purposes it is standard practice to use a peak deviation of 15 kHz requiring a bandwidth of 30 kHz. For a maximum modulating frequency of 3 kHz, the modulation index is M-15 ÷ 5.
modulation index is M - 3

Under these conditions the amplitudes of the various sidebands produced are shown in the following table.

ORDER OF SIDEBAND	AMPLITUDE	POWER
0 (Carrier)	-.1776	3.154
1	-.3276	10.732
2	.0466	.217
3	.3648	13.308
4	.3912	15.3
5	.2611	6.817
6	.131	1.716
7	.0534	.285
8	.01841	.0339
9	.00552	.003

The power is obtained by squaring the amplitudes and in this case multiplying by an arbitrary factor of 100 to make the figures look reasonable.

I now make the proposition that for a voice communication, all sidebands less than 20 db (a factor of 100 in power) below the sideband of largest power can be neglected. On this basis for M-5 all sidebands out to and including the seventh are significant. This would require a receiver bandwidth of 42 kHz.

I now make the proposition that for a voice communication, all sidebands less than 20 dB (a factor of 100 in power) below the sideband of largest power can be neglected. On this basis for M5 all sidebands out to and including the seventh are significant. This would require a receiver bandwidth of 42 kHz.

If instead of using M-5 we consider the case of M-3 the amplitudes are as follows.

ORDER OF SIDEBAND	AMPLITUDE	POWER
0	.2601	6.766
1	.3391	11.499
2	.4861	23.629
3	.3091	9.554
4	.1320	1 742
5	.0430	1849
6	.0114	.0129

For M-3 all sidebands out to and including the fourth are significant, this would require a receiver bandwidth of 24 kHz. So to include all significant sidebands in a 30 kHz receiver bandwidth, we have M somewhere between 3 and 4. This would correspond to a peak deviation in the range 9-12 kHz rather than 15 kHz.

It should be obvious to any F.M. operator who has listened to a weak highly deviated (÷ 15kHz) signal that contains a large amount of sibilants that some of the signal is extending beyond the 30 kHz bandwidth of his receiver. (Peak limiters aren't perfect either.)

I would therefore strongly advocate the use of 10 kHz rather than 15 kHz deviation in the amateur F.M. service. (Not to mention the number of narrow band receivers showing up of recent times).

73,

ROSS DANNECKER VK4ZFD

The Editor,
Dear Sir,

Like the rest of the community, the amateur service is experiencing the pangs of rapid change, and with the imminent revamping of the Wireless Telegraphy and Broadcasting and Television Acts the service will be subjected to close scrutiny — going back to the basics of our existence.

If justification of amateur radio as a going concern is necessary, the old hackneyed cliches concerning our role in emergencies and the past triumphs in communications pioneering should be put in moth-balls. The amateur service as a worthwhile pursuit can be well equated with the new look at leisure activities by governmental and community organisations. Whilst these days amateurs make no worthwhile contributions to the science of communications, the enhancement of individual knowledge and the international goodwill generated is clearly understood. It is indeed unfortunate, however, that the Post Office has used the proposed novice licence to placate the extreme political pressures promulgated by *citizen band* (i.e. pirate) operators. The Post Office's move may only serve to confuse the ideals and intentions of the service to further the cause.

There are difficult times ahead: the introduction of color television poses special threats in respect to electromagnetic compatibility and the lack of control over standards for stereo and electronic organ equipment (particularly) makes co-existence with neighbours an increasing dilemma.

There is an urgent need to co-operate with consumer organisations in establishing proper standards for this equipment and the WIA would also do well to establish technical parameters for amateur commercial gear and publicly condemn equipments which fail to meet the specifications. In an age of amateur *black boxes* we have and should enforce — equal rights with the $700 color TV user to *do your own thing*; any future legislation should homologate this precept.

Now that the visual pollution pilgrimage has finally reached the cerebral crevices of municipal councillors, most applications are being subjected (at least in Melbourne) to greater scrutiny. Amendments to the uniform building regulations in this state, the increasing rate of application refusals and the recent *public nuisance* litigation here are all blatant signs of changing community attitudes and total ignorance to amateur radio.

Over the next few months our bands will receive close inspection, particularly from commercial spectrum users. Amateur frequencies were measured by one national publication recently in terms of dollars per hertz — totalling up to a very impressive bill!

We must be careful to avoid the past mistake of applying for bands of such magnitude that they could not be realistically utilised in the near future. This tends to draw undue attention to the service and destroys the credibility of the Wireless Institute as a responsible body representing the interests of amateur radio in this country.

To avoid self destruction we must vitalise some of the good old maxims (such as *populate or perish*), encourage greater institute membership and participation, and present a stronger political lobby. More importantly, we must preconise the amateur service with emphasis on the municipal arena.

Good public relations and unity are essential ingredients in facing the new epoch.

Russell Kelly, VK3NT.

The Editor,
Dear Sir,

With the question of FM broadcasting in Australia subject to yet another inquiry I am reluctant to comment at this stage, however it is necessary to correct a wrong impression that could be gained from a report by John Adcock VK3ACA on a lecture delivered by Mr J. M. Dixon of the Australian Broadcasting Control Board. (August A.R.)

After comment on the operation of the experimental FM stations from 1947-1961 it was suggested that an inquiry recommended suspension of the transmissions due to an almost total lack of interest.

True the transmitters closed down without much appearance of public interest, however those who had supported the introduction of FM up to the time of the 1957-58 inquiry had been told in no uncertain terms that there was no future in continuing to advocate its introduction, then the Hunday Committee decided to transfer the FM broadcast band to television.

A study of the transcript of that early inquiry will reveal that there was considerable support for the introduction of FM. It will also show the almost vehement opposition from certain of the interested parties, even though the substance of these submissions has since been proved wrong, at that time the Control Board was swayed and decided against FM. That there was considerable interest at that time and also that the interest continued till such time as a further inquiry began is indicated in the Control Board report titled FM Broadcasting which was issued in June 1972 and recommended the introduction of a FM service. I feel that the report in AR would appear unfair to those who have advocated the introduction of FM broadcasting for so long, particularly as several of the early supporters were members of the WIA.

Allen Fountain, VK2YAH.

The Editor,
Dear Sir,

Congratulations for the improved standard of AR. I like
i the quality of the paper
ii the clarity of circuit diagrams
iii the general coverage articles.

I have just received my January 1974 copy of AR and liked it so much that I felt prompted to write and express my sentiments.

Graeme Scott, VK3ZIP.

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Magazine Index

With Syd Clark, VK3ASC

AMATEUR RADIO NEWS SERVICE BULLETIN. September 1973.
Aimed at improving the standard of Amateur Radio publications it provides a forum wherein Editors and others interested in such publications can air their views.

BREAK-IN. October 1973.
A Morse Code Generator: Home Built Coaxial Relay: Tune-Up with no Carrier Radiated: A Translatorised 6C221 VHF Adaptor: Regional Civil Defence Communications Seminar.

CQ TV September 1973.
Circuit Notebook No 14: 70cm Absorption Wavemeter: A 70cm Transmitter from Germany: Integrated Circuits Part 13.

HAM RADIO. September 1973.
220 MHz RF Power Amplifier for VHF FM: Solid State I.F. Sweep Generator: RF Speech Processor for Single Sideband: Coax Dehumidifier: One Crystal Frequency-Synthesizer for Two-Metre FM: Low Power VHF Dummy Load: Vertical Monopole Log Periodic Antennas for 40 & 80 Metres: Noise Reduction for CW Reception: Two-Capacitor Transmission-Line Matching System: Vari-Q Filter.

RADIO ZS. September 1973.
An Expanded Voltmeter: DF Transmitter De ZS2D: Taking the Gee Whiz out of Logics. The move to speaking and writing Afrikaans over the last few years means that "ZS" now means less to speakers of English.

VHF COMMUNICATIONS. August 1973.
FM Transceiver with Multichannel Synthesizer: Adjusting the Operating Point of Field Effect Transistors: A 10:1 Prescaler and Preamplifier with an Upper Frequency Limit of 250 MHz for Use with Frequency Counters. Receive Converter 432 MHz-28MHz, Matching the Transmit Converter DJ6ZZ 002: Notes on the 28MHz-432MHz Transmit Converter DJ6ZZ 006: An Integrated Receiver System for AM, FM, SSB and CW: Part 3 Carrier Oscillator: Oscar 6 Operations Summary: Miniature Receive Converter for 432 MHz-144 MHz for Portable operation and DF-Hunts: TV Pattern Generator.

NZART AMATEUR RADIO "CALL BOOK" 1973.
Commences with a short article by Tom Clarkson, ZL2AZ briefly covering Amateur Radio over the last 50 years. Then lists Callsigns and names and addresses of all New Zealand Amateurs. The balance of the 124 pages is crammed chock full of information for amateurs, Country Prefixes, International Callsign allocations, Small ships calling and working frequencies, Time Signals, Commercial Advertisements etc.

This offering begins 1974 and I would like to thank readers of "AR" for expressions of appreciation and words of encouragement offered to the writer during the year. My job is a pleasant way of doing a little to assist in the dissemination of information to Amateurs in VK. I will do my best to answer any queries which are raised by readers who should enclose a SAE with their query. Happy 1974 to all. VK3ASC. ●

VHF UHF
an expanding world

with Eric Jamieson VK5LP

Forreston, S.A., 5233

Times: GMT

AMATEUR BAND BEACONS

VKO	52.160	VKORSG Macquarie Island
	53.100	VKOMA Mawson
	53.200	VKOGR Casey
VK3	144.700	VK3RTG Vermont.
VK4	52.600	VK4WI-2 Townsville
	144.400	VK4WI-1 Mt Mowbullan.
VK5	53.000	VK5VF Mt Lofty
	144.800	VK5VF Mt Lofty
VK6	52.006	VK6VF Bickley
	52.350	VK6RTU Kalgoorlie
	52.900	VK6RTT Carnarvon
	144.500	VK6RTW Albany
VK7	144.900	VK7RTX Devonport
VK8	52.200	VK8VF Darwin
ZL1	145.100	ZL1VHF Auckland
ZL2	145.200	ZL2VHF Wellington
	145.250	ZL2VHP Palmerston North
ZL3	145.300	ZL3VHF Christchurch
ZL4	145.400	ZL4VHF Dunedin
JA	52.500	JA1 GY Japan.

Presumably the VK1 beacon still awaits the PMG's licence, so we cannot include it yet, and we are still waiting for the VK2 beacon. Leigh VK6WA writes from Morley with some news of the VK6 beacons. He advises an overhaul was given the old VK6VF 6 metre beacon, the old keyer being an optical-mechanical-electrical type stripped and cleaned. The transmitter produced 16 watts after replacement of sundry components, and commenced running again on 17th December into a horizontally polarised turnstile antenna about 16 feet above ground, which at Bickley is about 1000 feet a.s.l.

The 144 MHz beacon has died of old age, and should be put to rest in a quiet field to push up daisies — so says Leigh! The new solid state beacons are coming on slowly, and once the DX season is over no doubt the tempo of reconstruction will quicken. Danny VK6ZFF and Peter VK6ZDY are concerned with the new construction.

52 MHz AND THE DX

By the time everyone reads this the DX season will mostly be over, and all will be busy preparing their logs for submission to the Federal Contest Manager as their entry for the Ross Hull Memorial Contest. There were some very good scores being aired around. Some were very cagey about their high scores, whispering them just loudly enough into the SSB rig for the other end of the contact to hear and with hopes of no one else! Looks like Kerry VK5SU at Caduna gets the large end of the bone this year, having kept it after being challenged by Wally VK5-ZWW. The nerve of some guys!

I am sure most would agree it was a good DX season. Conditions were certainly not so consistently good as some years, but when the bands really got going there was plenty to work from all areas. Many contacts were made after the main DX had passed on due to the increased use of SSB, higher power, better receivers and antennas. SSB stations appeared to outnumber the AM stations, and no doubt will continue to do so. The boys on the FM nets were having a ball too, and several CW stations were noted.

In VK5 the 6 metre band opened to DX on 23 days of December, and possibly more if someone was around to be on the air. Probably the best days were 16, 22, 23, 30 and 31st. VK1 was worked on 4 days, VK2 on 11, VK3 on 7, VK4 on 17, VK6 on 12, VK7 on 9 and VK8 on 4 days. One should not be too concerned with the differences between the days worked in different areas because for a contact to take place there have to be operators at both ends, and sometimes only one end is available to go on the air. Nevertheless, it is interesting to note the number of times VK6 was available, and from the number of stations worked in VK6 it indicates quite a bit of renewed interest over there. It was not uncommon for VK5 to hear VK6 and VK2 or VK4 swapping numbers, so there was plenty of evidence of across-the-continent contacts. There were many occasions when back scatter contacts were made this year. More than usual I would venture to suggest. Perhaps the better equipment makes this possible, and the SSB type receiver probably handles the fluttery type of signal better, with the improved AGC system.

Probably the best overall days were 22nd and 23rd December with big short skip openings to VK3, which immediately gave the reminder to have a look on 2 metres. Some did, and the results are tabulated below in the 144 MHz news. 30th and 31st December were probably the best days for sheer coverage of the whole continent and New Zealand. What fantastic days they were! Many stations worked all States except for VK9, which appears to have been non-existent this year, plus four ZL districts. Wally VK5-ZWW was running up contacts at the rate of 40 about every 3 hours! Rod VK2ZQJ was worked here at the end of the month with a tremendous signal — in fact it seemed so broad I felt almost compelled to mention it, but on looking at the S meter decided otherwise. It is sometimes difficult to keep a signal narrow which sends the meter needle over to the stop!

It would be possible to go on and on about 6 metre openings. There is really so much of interest, but most of those who read these columns would no doubt be using the 6 metre band and be aware of most of the news, so perhaps I will leave 6 metres there for the [illegible].

144 MHz AND THE DX

Well, it did happen! 144 MHz openings across a large portion of Australia. There is a saying, "All things come to those who wait." Some of you will recall after last year's DX season I mentioned in these notes that you should get your 2 metre gear in order as I thought 1973 would be a year for some good 2 metre tropo openings, and continuing into 1974, and possibly 1975. Yes, it was printed in AR. Now I have waited nearly 12 months to have this dig. My friends in VK2 (yes, VK2) remarked on my comment — not directly of course, but Mike VK2AM noted on page 15 of "6 UP" for March 1973 that *"... This band was watched carefully this season as Es is expected to improve over the coming years. (Oh yeah ... according to whose theory? Ed)"* Of course the Editor is my friend Roger Harrison VK2ZTB, and I could certainly see the spear pointed at me!! Anyway, that's now one up against his duckhouse, and I'm tipping he will need another duckhouse after the 1974 season! Enough said, back to the news.

As 144 MHz openings of the Es type don't feature too often in these pages, I believe the following resume of openings as provided for me by Bob VK5-MM are worthy of inclusion for your reading. Saturday, 22.12.73: VK3AMK and VK3ZAZ worked VK4, VK1VP worked VK4EN, VK4ZAZ on Ch. B. VK1-MP worked VK4ZAZ Ch. B. VK2ZRH copied VK5SU, and worked crossband to 6 metres but no direct contact. VK5ZDY worked VK2ZRH at 1315. VK2GX to VK4EN on 146 MHz. Both VK2ZRH and VK2GX copied VK5VF. !

Sunday, 23-12. VK5SU worked VK2ZRH. VK5SU heard by VK2CG and VK1MP. VK5DK in Mt Gambier heard VK4ZAA and VK2ASI on Ch. B, moved down to low end of band and worked VK4FE at 1250.

At the same time VK5NC worked VK2ASI on Ch. B.

Thursday, 26-12. VK3ADT-P worked by VK5's.

Sunday, 30-12. VK4ZBB worked VK2ZBP on 146. VK4ZDI and VK4ZEL worked VK3AMK. VK5MC worked VK4ZEL.

Tuesday, 1-1-74. VK5 beacon heard by VK2ZRH. VK5SU heard by VK2ZRH. VK5RO and VK5ZWW worked VK2ZRH. VK2ZQJ heard VK5ZWW, VK5RO heard VK2ZQJ but said he was too strong to resolve successfully! VK5SU worked VK1VP, VK1MP and VK2AM. VK1VP heard VK5VF.

The above gives a reasonable summary of what took place. No doubt there were many other contacts made, but it does indicate that the observant stations get the rewards, and the fact that these contacts extended over a period of 11 days with a total of 5 openings is quite interesting, as most times in the past perhaps two such openings would be about the limit. (Please correct me someone!) Anyway, all this leads up to the fact that as a result of such wide coverages on 2 metres, more interest will be shown in that band, and more stations will no doubt take the air next year, with the possibility of even greater things to come. So let's all be in it. Remember: when the skip shortens, the MUF rises, and even the old telly can be a useful monitor on such occasions. When you can see stations on Channel 3, 4 or 5, have a look at 2 metres!

432-1296 MHz

Now while all the exotic 144 MHz stations were being worked, our friend Ron VK3AKC was not mowing the lawns. He and Kevin VK7ZAH worked each other on 1296 MHz on 27, 28 and 29 December, each contact being worth 280 points for the Ross Hull Contest! For good measure they also had contacts from time to time on 432 and 144 MHz. Good work gents. Thanks to VK7WI and VK7ZGJ for info.

GENERAL NEWS

Steve VK3ZAZ passes on some Central Victorian news, and mentions the large number of backscatter signals he can hear in the Learmonth area where he lives, 300 miles from Canberra and Adelaide. In addition to equipment mentioned last month, he now runs two 3 el. stacked verticals on 52.525, and an 88 metre leg rhombic fixed on N.E. Australia 32 degrees tilt, 16 degrees beam, gain approx. 12 dB, terminated and unidirectional. The rhombic is used for all his scatter contacts. His listings of stations coincides generally with those here, so it is difficult to know how much to include. I agree with him however, that if you look amongst the strong stations there is plenty of DX to be worked from other areas using the scatter techniques. Thanks Steve.

Laith VK6WA has some further information in his letter mentioned earlier in the beacon news, and this concerns his operations as an amateur in England where he operated as G4CLP during the last three months. He took a hand-held rig and had quite a few contacts on 144.480 FM net. He reports the channel is extremely active around the London area. 144.6 is used as a "natter" net, causing a considerable amount of wrath to be incurred by the RTTY operators who use the channel as a national RTTY net!

G63PI the repeater in Cambridge also is quite active and uses standard 600 kHz spacing with 1750 Hz tone burst access. Leigh also worked quite a bit of tunnable on 2 and this is something like 40 metres in VK2 or 3. The QRM has to be heard to be believed during a contest. Also a conglomeration of SSB stations to be heard on 145.41. Most of the operation on 2 metres is AM, with many using transistor VFO's. He even tried his hand at operating on 4 metres! Thanks so much for writing Leigh, I wish more would pass on this sort of news.

I expect as time progresses we will hear how the various VHF DXpeditions got along this year. Bob VK3AOT appeared to be having greater success than he did in 1971, when he was plagued by alternator troubles and boiling radiators! Mike VK3ASO and company were to be on Mt Cowley with 52, 144, 432 and 1296 MHz gear. The Mt Gambier boys were also going out. The weather was pleasant anyway, and plenty of contacts should have been available. I am currently threatening to go out myself next year!

Perhaps in closing, a summary of the DX situation. There certainly has been some help from the FM nets on 146 MHz this year in warning some operators of openings from other areas. This represents one way to keep an ear on the other band when operating on 52 MHz. More operators were heard trying it on 2 metres than other years. Surely this indicates there is a lot of 2 metre equipment around. Could it not be used more often during the remainder of the year? Best pointers to a rising MUF are still the short skip stations with very strong signals, and more operators are realising this. Finally, a good season all round, generally with very good co-operation. Some extremely pleasant and interesting contacts, and some very nice courtesies being extended to others from time to time. In all, VHF DX this year has been very pleasant and I am certainly looking forward to the same period next season.

Closing with the thought for the month: "The only suitable gift for the man who has everything is your deepest sympathy."

The Voice in the Hills.

Contests

with Peter Brown VK4PJ

Federal Contests Manager, G.P.O. Box, 638 Brisbane, Qld., 4001.

JOHN MOYLE MEMORIAL NATIONAL FIELD DAY.1974

By the time you read this the Field Day will be upon us and your good intentions of some time ago will be put to the test, unless you are well equipped to get out in the field at very short notice. Of course, if the situation is past redemption, you can still support the cause by giving numbers from your home QTH to keep the field stations busy, and send in your log.

Again I draw your attention to the opportunity for the VHF operators with a section of their own.

Also for the opportunity for portable field stations, HF, to make a second contact with any station after four hours have elapsed. I selected four hours to give the 24 hour stations the advantage as we all know how the late comer in contests so often gets it easy. Of course the six hour stations have their chance for additional contacts with the same station. Tell me what you think of the idea. This applies to the HF operator but the VHF men have the two hour rule as usual. That is a contact with the same station after each two hours.

The New Zealanders Field Day Contest is on the same week-end, Saturday 9th from 1500 hours to midnight, ZL time I guess, and Sunday 10th from 0600 hours to 1500 hours.

They use 80 and 40 metres only, phone and CW. ZLs may have a phone and CW contact within the hour if there is another contact-station between. Each hour means even hours as 1600-1700, 1700-1800, etc. ZLs will add their Branch number to the RST and serial. Their contest is primarily a Branch effort.

I hope that we can bolster each other's efforts.

By the way, I see no reason why, before you go out in the field or after you return, you should not take part in the contest as a home station as well as a field station.

ROSS HULL VHF-UHF MEMORIAL CONTEST. 1973-1974.

This contest will now be history. Make it good historically by sending in your log to help achieve our 200 logs. You still have time. Here, Dec. 29th, there have been reports of good openings to Nth Qld, VK3 and VK5 on 6 metres and also VK3 on 2 metres. I have not been able to crack it myself.

What did you plot on last month's chart for the Ross Hull?

Don't forget to include your comments on the distance scoring table for 1974-1975 Ross Hull. 1974 will be a big metric year.

ARRL TEN METER CONTEST

This was a poor contest for me. How did you fare?

I heard K2SJM working VK4 and SU but could not break him. A VK5 came through very strongly at 2305 but was too quick for me. Even JAs were too weak for me, although there were a few around the next weekend. Just the luck of the game.

CONTEST CALENDAR.

February

2nd & 3rd ARRL International DX competition phone.
16th & 17th ARRL International DX competition CW
9th & 10th Our John Moyle Memorial National Field Day. (Refer December Amateur Radio).
9th & 10th World SSTV Contest.
24th Central Coast ARC Field Day.

March

2nd & 3rd ARRL DX phone
9th & 10th World Wide VHF Activity.
16th & 17th ARRL DX CW.
23rd to 25th BARTG RTTY Contest.

SOME RD CONTEST COMMENTS THAT WILL INTEREST YOU.

VK5II. An article What the other chap thinks, Pix on the trophy and some details of members who passed on in the services. A few stamps with your log for Legacy. 4 stamps from each entry would keep a legacy ward for a year. A code with each report to indicate type of war service.

VK3III. Asked about RTTY contacts. I count as a contact. Also asked about VHF contacts beyond state boundaries. I would agree to count as a HF contact. Federal Council may comment.

VK5II. ". . . however a great contest, loads of fun and I really appreciated the HF boys that made an appearance on the VHF bands to help those with limited licences."

VK5EF. "This is my 21st consecutive contest". (Who can beat that?)

VK4III. "An extremely enjoyable contest . . . let us do it again next weekend." (I could not take it . . . but there is the Ross Hull!)

VK9II. ". . . the 1973 event is the best I have known."

VK2II. "The contest lived up to its name of the FRIENDLY CONTEST and I was able to break off for a couple of rag-chews."

VK2HZ. "I have been active in every RD Contest, except when in hospital, since its inception."

VK2II. "I have now operated in RD contests from VK9, VK7, VK5, and now VK2. The contest from VK2 is surely a lot harder in that each contact is the result of active hunting, yet much to my surprise this year's score is the highest that I have made. In reflection I am surprised that the score tables have been adjusted so well that operators in each state could end up with similar scores." (Also refers to lack of support for CW and suggests that scoring for VHF be equivalent to HF on a **time expended basis** —).

VK2II. (Approaching 71 years of age) ". . . did not stay up for the full 24 hours . . . Some of the fellows really put some effort into the contest . . . real dedicated effort and they deserve to get somewhere." (I wonder how many others appreciate the value of high contest scores to the Amateur movement?).

VK8II. ". . . unfortunately due to shift work I was not able to put in more than 2 hours. However I suppose every little helps." (Thanks OM, it certainly does).

VK7II. ". . . have been a licence holder since 1938 . . . first time I have taken part . . . despite the hectic conditions on the bands it was truly a great experience and to me a revelation of the great spirit of Amateur Radio, thanks to the high standards of the WIA and the journal Amateur Radio."

VK3II. "Enjoyed very much taking part . . . many call signs I have not heard for some time . . . good operating procedures and manners in the CW section . . . would hope that even a portion of the activity around would continue."

VK4II. ". . . But there is another skill interesting to the communicator. . . . That is of course cross mode CW-SSB, SSB-CW. Double the points for crossmode operation. . . . Finally reverting to the minority of non-members who support the contest . . . surely a small roneo batch of results could be graciously distributed.

Who knows, someone may respond with grace and dignity and become a WIA member and supporter.

Have you found or do you know someone not in the last contest that would enjoy our next contest?

Make sure you bring another into the 1974 RD Contest.

Now about our goal for 1973?

I make it 718 listed logs plus a late log I seem to have mislaid . . . we won't quibble over one log let us have credit for **719 logs for the 1973 contest.** That means we only need another 81 logs to get our 800 up next contest!)

WORLD SSTV CONTEST

Two periods: 1500-2200 GMT Saturday Feb 9th
0700-1400 GMT Sunday Feb 10th.

4th annual SSTV contest sponsored by "C Q Electronics" of Italy.

Contacts by SSTV only. Any band 3.5 thru 28 MHz.

Exchange: Picture, signal report, and QSO number starting with 001.

Scoring: One point for contacts on each band except 28 MHz worth 2 points. Score 5 multiplier points for each continent worked and 2 points for each DXCC country on each band. In addition W9, WD and VE call areas may be counted as a multiplier.

Final score: Total QSO points by the sum of the multiplier from each band.

Awards: Free subs to the three high scoring stations as well as to SWLs (picture).

Usual summary sheet etc.

Logs to Prof. Franco Fanti, via A. Dallolio n 19,40139 Bologna, Italy by March 20th 1974.

FRENCH DX CONTEST

Phone, February 23-24th, 1400 GMT Saturday to 2200 GMT Sunday.

Contest activity is not confined to the French continental stations.

You can also work French DUF countries and the following prefixes:- HB, LX, ON, 9Q, 9U, 9X, and 4U1ITU.

Exchange: Usual RS and serial commencing with 001. French stations will include 2 figures indicating their department.

Scoring: Each QSO counts 3 points. You earn a multiplier of one for each French department (95), each Swiss Canton (22), each Belgium province (10), each DUF country, plus LX and 4U1ITU worked.

Final Score: Total QSO points by sum of multiplier from all bands.

Awards: Certificates to top scorers in each country.

Logs to: REF Traffic Manager;Lucien Aubry, F8TM rue Marceau 53, 91120 Palaiseau, France.

I missed the CW section which was on Jan 26th-27th. No closing date given.

BERU CW CONTEST—1974

TROPHY MEDALLIONS FOR VK ENTRANTS.

The 37th Annual BERU contest will be held from 1200 GMT on Saturday 9th March 1974 to 1200 GMT on Sunday 10th March 1974. CW only. 3.5 to 28 MHz. Eligible entrants are radio amateurs licensed to operate within the British Commonwealth Call Areas. (VK1 to 8, and Lord Howe (VK2), Willes (VK4), Christmas (VK9), Cocos (VK9), Norfolk (VK9), Papua (VK9), New Guinea (VK9), Heard (VK0), Macquarie (VK0) and Australian Antarctica (VK0), are all separate Contest Areas.)

TWO TROPHIES have been presented for competition between VK stations — A silver medallion for the highest VK scorer in the official RSGB results, and a bronze medallion for a middle placed VK scorer decided on total VK entries divided by two, i.e., for 18 entries to 9th placing; for 23 entries to 12th placing. (The respective 1973 winners were VK3XB and VK6RV.)

SCORING. 5 points for contact, plus 20 bonus points for 1st, 2nd and 3rd contact with each other call area. (G-GM-GI etc count as one call area.)

LOGS. Separate logs are required for each band. Each band log should be separately totalled, and should include at the end a check list of call areas worked on the band. Details in logs to include Date, GMT, station worked, number sent, number received, bonus points, contact points, claimed total score. Also required is a declaration that the station was operated within the spirit and rules of the contest, also details of equipment used.

ENTRIES to be sent to A. V. Davies, 41 Gainsborough Road, Tilgate, Crawley, Sussex, RH10 5LD England. (By airmail, please) closing date 13th May 1974. ●

20 Years Ago

with Ron Fisher VK3OM

FEBRUARY 1954. Welcome to our Royal Guests! Editorial for February 1954 extended a welcome to The Queen and Prince Philip on their first visit to Australia, and what a memorable visit it was. Several excellent technical articles were featured. A. Hevyatt G3IFS-VK2AET described the operation and construction of 'Skeleton Slots'. These antennas originated in the United Kingdom during the war and became very popular during the post war years with amateurs and commercial manufacturers. However they only enjoyed limited popularity here in Australia.

Chris Cullinan was at it again with "Let's Listen". This was a self contained CW-Phone monitor. In the phone position, a diode detector was coupled into an audio output tube while for CW the diode output was used to power an audio oscillator. A very simple but effective idea. As a bonus, the unit could also be used as a code practice oscillator.

"The Complete Amateur". Tom Athey an ex-instructor for the Queensland Division Classes, commenced his series on the construction of a complete amateur station. Part one started with a general run down on the expected requirements plus a description of the VFO unit.

"A Treatise On Practical Modern Recording Tape". Mr. G. W. Steane told the story of how tape was made and why it was made in that particular way. I wonder how many can remember the old paper base recording tape. Things have progressed quite a bit in the tape recording field.

A 'Trade Review' was not a usual inclusion in AR of those days. However one on the Eddystone "700" communications receiver made interesting reading. I have not heard mention of this receiver either before or since this review was published. Although no price was quoted it was obviously in the high price bracket.

With a high level of amateur activity coming from the Antarctic regions, Hans Albrecht, VK3AHH, filled a need with his story "Antarctica". A short history and geographical description was followed with a list of personnel and a run down on the radio gear in use. ●

Ionospheric Predictions

with Howard Rider, VK3ZJY February, 74

This month's predictions from information supplied by the Ionospheric Prediction Service Division indicate point to point band openings for at least 50 per cent of the month.

Times quoted are GMT.

28MHz

VK2 to JA		0100-0800
VK3 to VK9		0500
VK4 to KH6		2300-0800
VK5 to JA		0200-0800
VK6 to JA		0300-1000
VK7 to VK9		0500-0800

21MHz

VK2 to SU		0500-1000
G (SP)		0800-0900
KH6		2100-0900
VE3		2000-2400
PY		2400-0100
VK3 to UA		0500-1000
W6		2100-0300
JA		2200-0900
ZS		0800-1000
KH6		2100-0800
VK4 to UA		0500-1000
KH6		2100-1000
JA		2200-1200
SU		0500-1000
VK5 to W6		2200-0300
JA		2400-1100
9G1 (SP)		0700-1000
9G1 (LP)	0900-0900	2200-0300
VK6 to W6		2400-0300
PY		1000-1100
ZS		0600-1200
VK7 to G (SP)		0800-1600
G (LP)		0900-1300
VK9		2100-1000

14MHz

VK2 to SU	1000-1700	2100-2400	
G (SP)		0700-1700	
G (LP)	0800-1300	2000-2100	
VK0		2000-1200	
VE3 (SP)	1400-1700	1900-2000	
VE3 (LP)	1400-1600	2100-2400	
VK3 to UA		0700-1500	
W6	0400-0500	1600-2000	
PY		2000-1300	
ZS	0500-0600	1200-1500	
KH6	0400-1400	1900-2100	
ZL		1900-1500	
VK4 to W1		1300-2000	
G (SP)		0700-1700	
G (LP)	0800-1200	1900-2100	
VK5 to W6	1600-1700	2000-2100	
JA	0600-1300	2100-2400	
9G1 (SP)	1400-1600	2200-0200	
9G1 (LP)	0800-0900	2200-0300	
UA		0700-1600	
VK6 to W6	1600-1800	2100-2200	
PY	2300-0400	0600-1200	
ZS	1200-1300	0300	
KH6	0600-1400	1800	
VK7 to G (SP)		0800-1600	
G (LP)		0900-1300	
VK9		2000-1800	
W1		1300-1500	

7MHz

VK2 to UA		0700-1500
W6	0400-0500	1600-2000
PY		1900-1500
VK3 to G (SP)		1500-2100
G (LP)		0800
VK0		2400-2400
VK4 to KH6	0400-1300	1800-2100
VK5 to ZS		1600-2100
VK6 to W1		1000-1300
VK7 to SU		1300-2100

Hamads

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Ex. US Army FM transceiver, 30 to 76MHz, 20 CH per MHz, all solid state, 12-15V DC. Any Offers? For further information contact Mr. B. F. Henne, 12 Ash Street, Morwell, 3840 or phone (051) 34-4275.

Homebrew transceiver, hybrid circuitry with 2E26 final. Works only on 14MHz at present. Homebrew triband quad. Purchaser to remove. Estate of late VK4BM. Offers to Mrs. Mead, 8 Cross Street, Mitchelton, Qld, 4053.

AWA MR3A Carphone, 3/12 final, 3 channel, $25. **Pye** Mk3, 6M $12. VK3YAZ. QTHR. (03) 25-2688.

AWA MR6A FM Carphone, Ch. A, B, 1 and 4. Fet pre amp. service manual and circuit diagram $70. ONO. Eric Gray, VK3ZSB, 15 Catalina Avenue, Ashburton, 3147. Ph.: Bus. (03) 630-5656, AH 25-3249

2m AM Tx 6146 final. Geloso VFO front end plus 1 Xtl inbuilt screen mod.
6m AM Tx 6BW6 final 2xtls inbuilt screen mod. **Weston LM50** 6m TX-RX. 6146 final (50W) 2 X 807 mod. Dynamic mike has MCW and CW also. Inbuilt BFO for CW-SSB. RX turntable. TX Xtl cont. What offers? VK2AFF. QTHR. Ph.: DAPTO 61-4267.

Television Sets, Ex trade-in. Sell for cost price, average $7.50 each. Suitable for experimenting or parts, some may be working. Apply 19 Benwerrin Avenue, Baulkham Hills, 2153.

Swan 250 6M (50-54MHz) transceiver with Swan 210 external VFO 240V supply handbook. 200 watts PEP input. Excellent performer. Price $300 ONO. VK3ZGP. QTHR. (03) 359-1357. evenings.

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Heath Kit HW7 CW QRP transceiver only 4 months use, reason for sale, going SSB. Price only $85. VK5NQ. Flat 63, Block G. Woomera, S.A., 5720.

Hy-Gain TH3 JNR Beam on the ground, complete with instructions, $50. VK3LC. QTHR. Ph.: (03) 50-2566.

Complete Tx stn 80-2m comprising—80-10 RF 813 deck 150W Geloso VFO; 2m RF deck QQE03-12 driver to QQE06-40 final xtl-locked on 144.123MHz; both units from common PSU/modulator. Pye base stn 6m-Tx/Rx xtl on 53.032. 2m convertor ECC2000 front end, xtl controlled. Complete stn for $195. VK3TK. Graham Clements, 12 Whitty St., Sunshine Ph.: AH (03) 311-2363.

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Silent Keys

Mr. A. HARTLEY, VK2VY
Mr. R. R. ANDERSON, VK3UR
Mr. W. J. MEAD, VK4BM
Mr. W. R. PHIPPS, VK6WP
Mr. C. N. (Newt) KRAUS, W1BCR

OBITUARY

Friday 23rd November saw the passing of **W. R. (Bill) PHIPPS, VK6WP.** He was aged 75 years and was a Life Member of the VK6 Division, having been elected to this position on July 19th 1965.

Bill had been an amateur operator since about 1918 and was closely associated with radio broadcasting since its inception in Western Australia. Together with the late Wally Coxon VK6AG, Bill Phipps helped to establish 6WF when it was originally owned by Westralian Farmers Co-operative. (Now an ABC station). With the transmitter operative, it was necessary to have receivers, and Bill was in charge of the manufacture of the "Mulgaphone" receiver.

His amateur activities were originally conducted in the 200 metre band with broadcasts of music, but with the coming of commercial radio this practice was discontinued.

Bill was a foundation member of a radio club formed by Mr Vincent Mathews which met in the premises of Stotts Business College. Other members included such old timers as Hal (Tinny) McKail, Arthur Sibley, Jim Austin VK6SA, Mal Urghart, Bert Congdon. From the humble beginning of this club, later emanated the Subiaco Radio Society and the WA Division of the WIA.

Although not active over the last few years in the amateur world, Bill still carried on his business in Victoria Park, and was well liked and respected throughout the trade. It could be truly said that Bill Phipps was one of the pioneers of radio in Western Australia and radio is much the poorer with his passing.

Awards Column

with BRIAN AUSTIN VK5CA
P.O. Box 7A, Crafers, SA, 5152.

The following awards are available to licensed amateurs and shortwave listeners (on a "heard basis"). Contacts on and after 15th May 1962 are valid. Do not send QSL cards. A list of contacts should be certified by the Awards Manager. The fee for each award is five IRCs. The address for applications is R. C. Paraguayo, Awards Manager, Post Box 512, Asuncion, Paraguay.

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Rules:

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Class C 16 countries in 4 ITU Zones.

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12 FY, HC, HC8, HK, OA, PJ, PZ, 8R, 9Y4, YV, YV0.
13 PY (North of 16 degrees 13 minutes South) PY0 (Fernando de Noronha).
14 CE (North of 40 degrees South) CE0Z, CP, ZP, CX, LU (North of 40 degrees South)
15 FY (South of 16 degrees 13 minutes South), PY0 (St Peter and Paul).
16 CI (South of 40 degrees South), VP8 (Falkland Is), LU (South of 40 degrees South).
73 VP8-LU-Z (South Georgia), VP8-LU-Z (South Orkney), VP8-LU-Z (South Sandwich) VP8-LU-Z-CE9-AN-AZ)

DIPLOMA PARAGUAY

Stations require five confirmed contacts with stations in Paraguay.

SATELLITE "1000" AWARD. Congratulations to VK7LZ upon being the second VK station to qualify for this Award. He was issued with Award No. 168 on 29th November. Congratulations also go to VK5HI on qualifying for Award No. 169 on 11th December. ●

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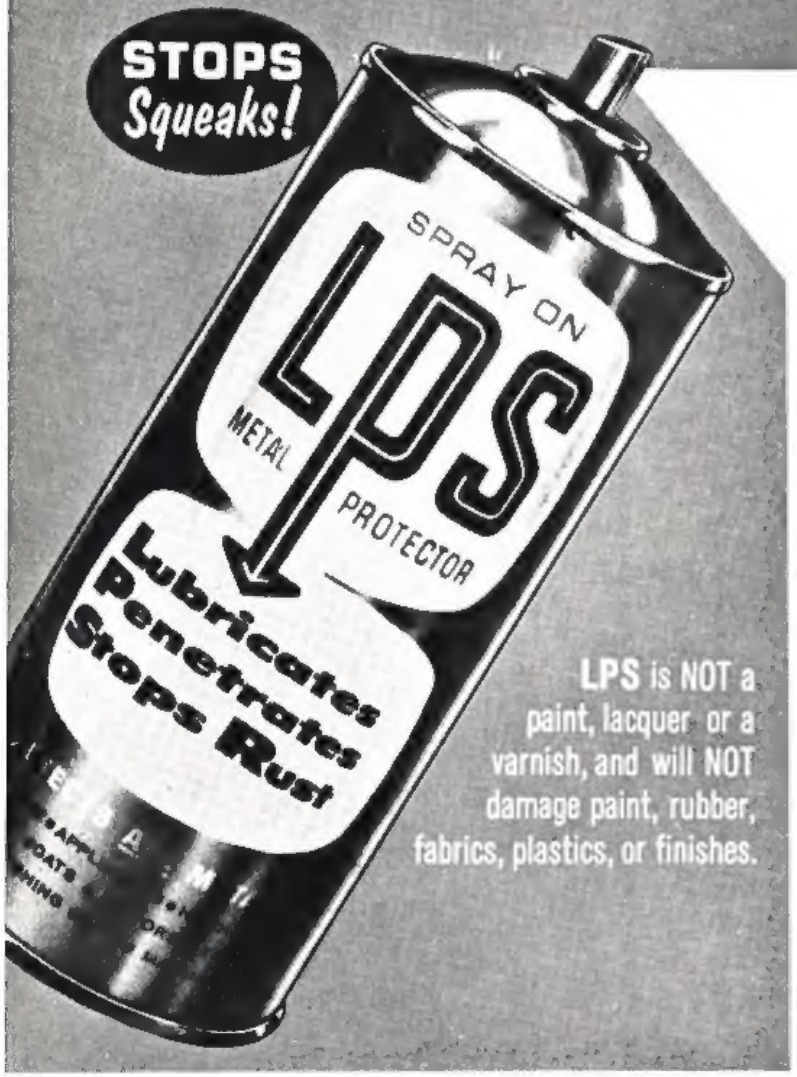

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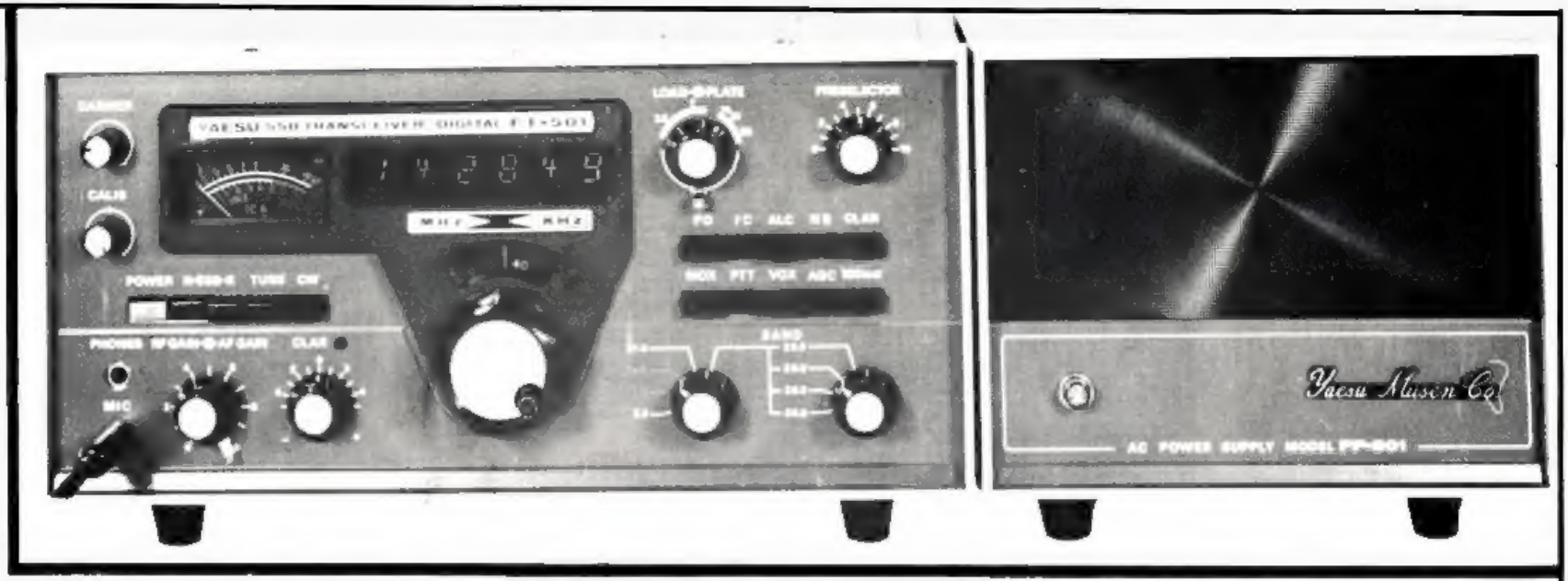

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Separate Rx input coils for optimum front end performance.

SPECIFICATIONS

FT-501 DIGITAL TRANSCEIVER

FREQUENCY RANGE :
3.5-4.0MHz, 7.0-7.5MHz, 14.0-14.5MHz, 21.0-21.5 MHz, 28.5-29.0MHz. Crystals optionally available for ranges 26.0-28.5MHz, 29.0-29.5MHz and 29.5-30.0MHz.

TYPE OF EMISSION :
LSB or USB (selectable) CW.

POWER INPUT :
SSB 560 watts (Pep output approx. 330w) (slightly lower on 10 metres)

CARRIER SUPPRESSION :
40 db.

SIDEBAND SUPPRESSION :
50 db at 1000Hz.

SPURIOUS RADIATION :
Down 40 db or more.

TRANSMITTER FREQUENCY RESPONSE :
300Hz-2700Hz.

DUAL-SPEED COOLING FAN

DISTORTION PRODUCTS :
Down 30 db or more.

ANTENNA OUTPUT IMPEDANCE :
50-75 ohm unbalanced.

FREQUENCY STABILITY :
Less than 100Hz drift in any 30 minute period after warm-up.

SENSITIVITY :
0.5uV input for 20db S/N.

SELECTIVITY :
SSB 2.4kHz at —6 db, 3.8kHz at —60 db.
CW Filter (option) 600Hz at —6 db,
1.2kHz at —60 db

IMAGE RATIO :
50 db or more.

I.F. INTERFERENCE RATIO :
50 db or more.

AUDIO OUTPUT :
3 watts/5 ohm load (10% THD).

POWER CONSUMPTION :
Receive 140VA, Transmit 650VA max. (with separate power supply Model FP-501, 234V 50Hz A.C.).

DIMENSIONS :
160mm (6-¼ inches) high, 350mm (13-¾ inches) wide, 290mm (11-½ inches) deep.

WEIGHT :
Approx. 10Kg. (22 pounds).

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